VOLUME III, No. 2 February, 1961

EDUCATIONAL RESEARCH

A Review for
Teachers and all concerned with
Progress in Education

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THE NATIONAL FOUNDATION FOR EDUCATIONAL RESEARCH IN ENGLAND AND WALES

by
NEWNES EDUCATIONAL PUBLISHING CO. LTD.
Tower House, Southampton Street, Strand, London, W.C.2

EDUCATIONAL RESEARCH

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HOMES AND SCHOOLS: SOCIAL DETERMINANTS OF EDUCABILITY

by JEAN FLOUD, *Reader in the Sociology of Education, University of London*
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SCHOOLS are selective institutions ; this is only another way of saying that some children do better than others. But do the schools select socially, as well as academically or intellectually? If we ignore chance features of family environment and personal life history, do children of equal (presumed or measured) ability have equal opportunity of access to schools of various types, and equal chances of success in them, regardless of their social origins ? If not—if schools are not freely open to all, and if their pupils' chances of success are systemically related to the religious, ethnic, or social-class affiliation of their families—what are the factors at work ?

These are questions of relatively recent origin. They had little meaning, indeed, before the rise in the inter-war period of the notion of equality of educational opportunity; and they took on practical relevance only after the Second World War, when the supply of highly-trained man-power in the advanced industrial countries began to be recognisably inadequate. Under the dual impetus of the egalitarian desire to secure every child's birthright to an education suited to his age, ability and aptitude, and of the 'search for talent' which has reached a new pitch of intensity post-Sputnik in the United States, the desirability of reducing all differences of educational performance or success to differences of natural endowment, has gained wide-spread acceptance as a touchstone of policy. The tacit objective has become to produce, as it were, a natural order of inequality, unmarred by factitious and irrelevant social differences.[1]

From the point of view of the social investigator, this raises many problems both of technique and principle. Educational opportunity must be defined and measured; its social distribution must be assessed and related to the social distribution of 'ability', likewise suitably defined and measured. Criteria of educational performance must be set up, and they must be capable of comparison both as between school and school, and over time. Finally, the full range of social factors at work (e.g. socio-economic status, father's education, mother's occupation before marriage, family size, etc.) must be identified, and the manner of their influence on performance examined. The investigation of these problems evidently calls on a wide range of techniques, from those of the demographer to those of the social psychologist.

There has now accumulated an extensive literature on the social differences underlying selection in education. As has already been indicated, these differences may be regional, ethnic or religious, as well as social-class in character. However, the discussion here will be limited to the latter, with particular reference to what is known from social investigations of the problem in England and the United States.

It is worth noting, to begin with, that the structure of education has little influence on the extent of the problem. This is not surprising. In an industrial society, education is inevitably increasingly involved with the dynamics of the class structure and with the economy. We are familiar with the tightening bond between occupation and social class, and between education and occupation; and whatever the characteristic mode of educational organisation, it seems inevitable that schools, colleges, and universities should perform selective functions which, to a greater or lesser extent, tend to overlay, or possibly impede, their pedagogical purposes[2].

Thus, in England, the educational system is overtly selective. Not only is there an important private sector, but within the public (grant earning) system promotion from primary to secondary school still involves, over most of the country, selection by competitive examination for admission to grammar and technical schools. In America, on the other hand, a free system of primary and secondary schools is now of long standing. Yet social class inequalities in type and amount of schooling have excited social investigators in both countries since the 1920's.

In England, the obvious first task for sociologists was to measure social-class inequalities of access to the selective secondary schools and to their counterparts in the independent system. Distinguished work was carried out in the tradition of 'political arithmetic' by Professor Lancelot Hogben and his associates at the London School of Economics in the 1930's[3]. They established the use of clear measuring devices; 'ability-opportunity' ratios, and 'class chances' of education, derived from the social and intellectual composition of educational institutions related to that of the population from which they are recruited. After 1945, when secondary school places were made free of fees and open to competition, it became necessary to explain the persistence of inequalities under conditions of free competition, and to ask what are the obstacles to 'perfect' representation of the population at large within selective schools and universities[4]. Studies of the class-conditioning of educational chances now are supplemented by research into its influence on educational performance and vocational aspiration. Study of social selection *for* education is extended by study of social selection *through* education.

Thus, since the end of the Second World War, sociologists have shown marked interest in documenting more thoroughly the extent of social selection for education, and in penetrating the processes by which it goes on in the schools, and the manner of their connection in this respect with the wider social structure[5]. Investigations have been carried out on both sides of the Atlantic into social selection within the school; that is, into the influence of children's social-class position, variously defined, on achievement and deportment in school—on the relations of children with their classmates and with their teachers; on their attitudes towards discipline and the rewards and punishments they attract to themselves[6]. A picture emerges in both countries of working-class children, on average, doing less well than others academically, being rated by teachers lower on personality characteristics associated with academic attainment, expressing less concern themselves about their progress in school, participating less in extra-curricular activities, leaving school at an earlier age and aiming less high vocationally.

The problem of educability falls somewhere between psychology and sociology, and the division of labour between them in this field of work is unclear, and likely to be

blurred still further with every step forward which is made. Psychologists have been mainly responsible for the systematic accumulation of knowledge of the relations to educational performance of two major aspects of social environment, namely socio-economic status and family size[7]. But these relations have still to be elucidated. As McClelland points out[8], the question of the linearity of the relationship of intelligence tests scores to school performance has not been studied as it deserves. He asks pertinently, "Let us admit that morons cannot do good school work, but what evidence is there that intelligence is not a threshold type of variable; that once a person has a certain minimal level of intelligence, his performance beyond that point is uncorrelated with his ability ?", and he urges, "the desirability of plotting carefully the relationship of ability-test scores to performance criteria *over the entire range*, in order to check for acceleration, deceleration, or other curvilinear relationships." Moreover, despite the well-established influence of socio-economic status on the achievement in school of pupils matched for measured intelligence (I.Q.) no thorough study has been undertaken of the relations between these three variables throughout the whole range of each.

The meaning of the relationship with family size is likewise unclear. It is a well-established fact that educational performance is negatively correlated with family size at all social levels (i.e. within as well as between the social classes); but there have been few attempts to discover whether and under what circumstances a large family may be a causal factor, in the sense that it produces of itself an unfavourable educative environment for children, or is simply an index of a complex of educationally relevant attitudes and values on the part of the parents[9].

For their part, sociologists have been principally concerned with the nature of 'environment', by which they have meant in the main, 'home background', i.e. features of family and neighbourhood environment, including the peer groups of children and adolescents[10]. These have been investigated with increasing refinement. There has been a shift of emphasis since 1945, away from the study of gross material factors such as poverty, malnutrition and overcrowding, to more subtle features of home background affecting response to learning in general as well as to particular types of schooling. Class differences in attitudes towards children's education and future occupations, the significance of the educational level reached by parents, or of the social grading of the mother's occupation before marriage, are being explored; as well as, much more fundamentally, the differences in emotional training and linguistic habit and development characteristic of children from different social backgrounds[11]. But the study of the school as a factor in educability has been neglected; little has been done to explore in any detail the explicit and implicit demands of life in school, to which pupils are disposed to respond selectively in terms of their social experience outside its walls.

The problem of educability has in fact been approached in somewhat one-sided fashion by sociologists, although the influence of the social anthropologists has offered something of a corrective[12]. That the interaction of homes and schools is the key to educability has always been evident to anthropologists in cases where the gulf between them is wide, as when formal education is introduced into the tribal life of pre-literate peoples. Although detailed studies of culture-contact and social change through edu-

cation are regrettably rare, the influence of the anthropological approach is strong in the studies of the American Negro from which stemmed, until recently, the most illuminating work on social-class differences in the drive towards educational success. Moreover, the most promising penetration of social-class factors in educability has come from attempts by social anthropologists and social psychologists to analyse child-rearing practices from the point of view of their adaptive value in competitive 'middle-class' school systems, and to study motivation in learning as influenced by the balance of power and interaction characteristic of different kinds of family 'culture'[13].

All this has done much to deepen our understanding of educational and institutional factors in the learning situation. But much work remains to be done, and especially on the institutional factors referred to. It is a fact that the educational significance of features of 'home background' has not been fully exploited, largely because there exists no sociology of the school to which they can be related.

In principle, we may say that there are two main sources of social influences on the educational process; there are those deriving from the family environment, and general background of teachers and pupils (and, in the case of teachers, also from their professional needs and habits); and there are those deriving from the social organisation, formal and informal, of schools, colleges and universities. The child may come to school ill-equipped for or hostile to learning under any educational regime; but for the most part his educability depends as much on the assumptions, values and aims personified in the teacher and embodied in the school organisation into which he is supposed to assimilate himself, as on those he brings with him from his home.

This is nowhere clearer than in the case of the so-called 'early-leavers' from the English Grammar school and the Scottish Secondary schools, or the 'drop-out' from the American High school, which we cite by way of illustration. The social, as distinct from the academic, character of this process of selection—which culminates but does not begin at the threshold of advanced courses at the top of the school in England and Scotland, or at the point of college entry in the United States—is well established[14]. In the English Grammar school, with its selected population and rather specific educational programme, it takes a particularly clear form. Changes in the rank order of entrants are systematically related to their social-class origin, to such effect that the proportion of children in the top one-third of the performance hierarchy who are drawn from working-class homes falls steadily, from about two-thirds at the beginning to around one-third at the end of the seven-year school course[15].

American experience, essentially similar, but less well defined in the context of a non-selective school system, makes it clear that this process of social as distinct from academic selection, is something that goes on with varying degrees of intensity and thoroughness in all kinds of school. The problem is not merely to document its existence but to understand its working. This involves the study, not merely of the 'home background' of pupils, but of the school as a relatively self-contained social system, purposeful in a formal sense, rife with its own conflicts, exerting its own pressures and making its own demands, formal and informal, tacit and explicit, on pupils who respond selectively in terms of their wider social experience.

We hope to discuss in a subsequent article the study of the social system of the school, and to show that until we understand schools at least as well as we are now beginning to understand 'home background' we shall remain ignorant of many powerful 'hidden characteristics' of the learning situation.

(*In preparing this article, the authors have drawn heavily on* THE SOCIOLOGY OF EDUCATION. A TREND REPORT AND BIBLIOGRAPHY *prepared by them for* CURRENT SOCIOLOGY, *Vol. VII*, 3. *Basil Blackwell*, 1958.)

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THE DESIGN, CONSTRUCTION AND USE OF STANDARDISED TESTS - Part 1

by D. A. Pidgeon

I. What tests measure

IN everyday life, we often observe people behaving in certain situations or on certain tasks and make an estimate of their performance. We may say, as a result of our observations, " That man is intelligent," or " That boy has mechanical ability," or again " This child's attainment is well above average." Such statements are liable to be highly subjective opinions and at best will be valid only within the experience of the person making them. They are of little value if we wish to take the combined opinion of a number of observers. But if a number of selected tasks can be so ordered that we are able to observe objectively how people perform them in a standardised situation, we can, as a result, put those people into an order of merit according to their respective performances. We call such a collection of selected tasks given in a standardised situation a test, and its main purpose is to assist us in the assessment of human behaviour.

A test, then, attempts to measure behaviour, and we can legitimately define what a test measures only in terms of the sort of behaviour required to complete it. For example a child responding to a set of carefully selected arithmetical problems that have been brought together to form a standardised test can be said to be demonstrating arithmetical ability. Ability, however, is a general term and it may be used to cover other commonly used expressions such as ' attainment ' or ' aptitude.' It is desirable therefore, to assign specific meanings to such words, using ' ability ' to cover fairly broad types of performance, 'attainment' to cover behaviour that has resulted from specific teaching and ' aptitudes ' for performances that, so far as we can ascertain, have been learned without specific teaching and which we can use to predict future behaviour. Into this classification we can fit various kinds of tests, such as ' general ability ' or ' intelligence ' tests of attainment in reading or arithmetic and tests of mechanical 'aptitude' used to predict likely success in technical courses.

Apart from the different meanings attached in everyday usage to the words ability, attainment and aptitude, there is a considerable overlap in the actual content of the three types of test themselves. It is difficult to distinguish clearly between what has been formally taught and what has been learned incidentally. Similar items often appear in tests bearing different names. The simplest classification is therefore perhaps one defined in terms of the purpose for which the test is required.

If we wish to measure school accomplishment, we can devise a suitable test and describe what is measured as attainment. Thus an attainment test is, in a sense, a descriptive statement about what children can do within a specified field of work and at a given time. For any one child it gives an indication of his level of achievement and this can be related to the performances of a specified group of children on which the test was

standardised. As a result of observing the behaviour of a child on an attainment test we can say that compared with a standard population his performance was above, below or just at the average; alternatively we can assign the child a score on an arbitrarily devised scale which relates his performance to that of a standard population.

Coming within this same category are ' diagnostic ' tests. These also measure accomplishment but instead of relating the results to the performances of other children, the specific behaviour of an individual is related to the known body of knowledge of the subject tested. For example, by observing which particular sums a child or class has answered incorrectly in a diagnostic test of arithmetic, a teacher is provided with useful information on which to base his future teaching in arithmetic.

Quite often a test is required to predict future behaviour, and it is convenient to call tests designed for this purpose aptitude tests. It is important to remember, however, that any test only measures *present* behaviour, although it is often possible, from this, to make inferences about future learning. Straightforward tests of attainment have been shown to be useful in predicting a child's performance on a later occasion, but the prediction is likely to be specific to the subject tested. If, on the other hand, we want a measure of aptitude for learning, say, in a general academic course of education, then the test must cover a far wider range of behaviour than that usually associated with a single attainment test. Such a test, covering a wide range of behaviour, and employing verbal, numerical and perhaps abstract reasoning items is sometimes called an intelligence test, although, if the behaviour covered by it is restricted to the kinds of learning which schools aim to produce, it is more appropriately labelled a scholastic aptitude test.

Human behaviour is exceedingly complex and the most elaborately designed and carefully constructed test can, of course, only attempt to measure a small sample of it. It is important, therefore, to realise that, reliable as it may be, the information available from an educational test is limited, and care should be taken not to draw inferences that go beyond what can reasonably be deduced from an examination of the behaviour covered by the test.

Standardised tests can render a valuable service to teachers if competently used. The results they give can be misinterpreted—sometimes dangerously so—if their function and purpose are not properly understood.

II. How tests are constructed

As a preliminary to describing how the modern standardised test is constructed it would not be inappropriate to give briefly the main points of difference between such a test and traditional types of examination paper. These differences are, of course, reflected in the actual process of construction of the standardised test, but the reasons for them should be known if the value of tests is to be fully appreciated.

In the first place, the relatively few questions requiring somewhat lengthy responses of the examination paper are replaced in the test by a fairly large number of items which for the most part need only a short one or two word answer. This means that the range of possible questions that *could* be asked is more adequately and deliberately sampled and the risk of taking a biassed selection is practically eliminated. Second in importance,

perhaps, is the emphasis upon objective scoring in the test, which reduces drastically any unfairness that might arise from the subjective judgement of the marker. This objectivity is often achieved by the use of ' multiple choice ' responses, although in many tests, especially tests of attainment in English, what are known as ' creative responses ' are nowadays employed. Provided sufficient care is taken in their construction and adequate guides supplied to markers, even complete sentences or short paragraphs can be demanded as responses and the subjective influence reduced to a minimum. The net result of both these differences—more items and objective scoring—is an increase in the reliability of the measure obtained. Reliability is here used to denote the consistency with which children are likely to be put in the same order if given the test on different occasions. It is clearly important, if the results are to be of value, for the reliability to be relatively high—little reliance can be placed upon a result if it is known that on a subsequent occasion a child's score is likely to be quite different.

Most of the other points of dissimilarity are concerned with the actual construction. The items appearing in a good test will all have been thoroughly tried out before being selected for inclusion, and in addition, as is described below, by giving the test to a large representative sample of children, the possible ranges of performance on it are carefully established. With the usual type of examination paper, comparatively little time is required to prepare it, but because of the subjective element in the marking and lack of knowledge about its overall behaviour, considerable skill and labour are required to assess a child's performance: with the standardised test all the time and skill goes into its construction and the scoring is relatively easy. A note of caution should be added to the foregoing statement; the relative ease with which a test may be scored should not detract from the importance to be attached to the careful interpretation of the results. This is a point to which we will return later.

Details of the construction of a particular test will depend upon the purpose it is intended to serve, but for most tests, a similar sort of plan is adopted although the concentration of work may differ at different stages. Let us suppose that it is desired to prepare an ability test for eleven year old children. First the number of items it is to contain must be decided upon. There is of course no number of questions which is right for all purposes and the number chosen depends upon the testing time available and upon the degree of reliability. The longer the test the more reliable it is likely to be. Experience shows that the average eleven year old child will complete about 100 items in a test of this kind in about 45 minutes without being unduly fatigued. It is necessary to devise at least four times the number of items required for the final version of the test, and in devising the items the skilled test constructor will be guided by his previous experience. Without such experience it would probably be necessary to double the number of original items.

The next stage is to select from the total number of items the 100 most suitable and efficient for the test. This is not an arbitrary business; the selection is made not by the test constructor but by the children themselves. The 400 items are arranged in drafts each usually containing about 75, and administered to a group of between 120 and 150 children chosen to be representative in age range and ability of the children for whom the test is finally intended. These drafts are given without time limits and it is usual to restrict

the administration to one draft per day. When all the items have been attempted by all the children, the drafts are marked and each item is then submitted to a detailed analysis. First the level of difficulty of each item is ascertained by calculating the percentages of children getting it correct. Items that are too difficult (less than 25% correct responses) or too easy (more than 85% correct responses) are discarded, for it is clear that they cannot usefully serve the main purpose of a good item in a test of this kind, which is to discriminate most effectively between those who demonstrate the ability being measured and those who do not. The next stage of the analysis is to determine how effectively the remaining items are achieving this discrimination. A number of different techniques have been developed for this purpose but they are all based upon a measure of the agreement between success or failure on the item in question, and success or failure on the test as a whole. For an item to discriminate effectively, those who possess the ability being measured must be able to get it right, while those who do not possess it should get it wrong. This important point can best be demonstrated by considering the hypothetical situation arising from a test of 100 *perfectly* discriminating items. If the facility, or difficulty level, of each item was exactly 50%, then we would find exactly 50% of the children getting every item correct—that is, scoring 100—and the other 50% getting every item wrong—that is, scoring 0. Of course, perfectly discriminating items are not found in actual practice, but the ' efficiency level ' of the items in a well-constructed test may be very high indeed.**

The 100 items eventually selected are then submitted to a further check. If the item is a question in which the child has to choose one of a number of given responses, an analysis of wrong answers is made. If the same wrong answer is chosen by too many children it must be eliminated; elimination is particularly necessary if this wrong answer is picked by children who do well on the test as a whole. Tests sometimes employ ' open ended ' items in which the child has to supply a word, phrase or sentence. It is then necessary to analyse all the different answers given, both right and wrong. If too many children give the same wrong answer the question is probably ambiguous and is discarded or re-worded.

The next stage is to assemble the chosen suitable items into a second draft to be tried out again on another representative sample of children. On this occasion it is usual to impose a predetermined time limit in the light of previous experience and the purposes for which the test has been constructed. The number of children failing to finish is noted so that a change can be made if necessary. After the drafts have been marked, the complete item analysis is repeated in order to confirm the previous results. Errors in the figures obtained may occur, due simply to variations arising from the use of different samples. If a bad item is revealed by this second analysis it must of course be replaced.

The main purpose, however, of this second try-out is to check upon the *validity* of the test, that is, the test constructor needs to be satisfied that the test really is measuring what he wants it to measure. To do this, the scores on the new test can be checked against teachers' judgments of the ability being measured. Another method more usual

**Incidentally this example demonstrates very well how the distribution of " raw " (i.e. actual) scores on a test may be structured by the selection of items of differing difficulty and efficiency levels. In the hypothetical example quoted the distribution is, of course, perfectly dichotomous. In actual practice if a test is required to discriminate effectively over the whole range of ability, a rectangular distribution of raw scores is aimed at and very often achieved.

these days is to administer to the same group of children another test of the same kind which has been extensively used and proved to be useful for the purpose for which it was constructed. The results obtained on both the new and the established test are then compared.

Finally, when all necessary revisions have been carried out, and the test constructor is satisfied, the new test is printed. It can now be said that the half-way state has been reached, for there remains the all-important task of *standardising* it. For this purpose the test is given to a large representative group of children of the required age range. This group is chosen so that it is as typical as possible of all children and takes account of such things as sex, intelligence, kind of school attended and whether they live in the town or country. Precise instructions for the administration of the test will, of course, have been worked out previously, for it is important that the conditions under which it is taken should be as uniform as possible on all occasions.

The purpose of the standardisation is to discover precisely how children perform on the test and then to relate the scores they obtain to an agreed scale. The average of the actual or 'raw' scores is calculated and also how the scores are dispersed about the average. In addition, since there is generally a variation in the average scores obtained by children differing by only a few months in age, it is necessary to determine the rate of increase in score per month of age. The raw scores themselves cannot of course be used for comparative purposes, since the mean or average raw score and the spread of scores will vary from one test to another, so that a child, for example, who is average in two tests may well obtain different raw scores. There are a number of different scales to which the raw scores can be transformed, as we shall see later. The process of standardisation, which usually involves the preparation of a conversion table for transforming the raw scores to those of the agreed scale, involves a fair amount of computation, but the result of it means that the performance of any child on a test may be assessed by comparing him with a representative sample of children.

III. Methods of expressing test scores.

Reference was made in the last section to the fact that raw scores are inadequate if the performances of children on different tests are to be compared. They convey nothing in themselves, for unless we are also given some more information about the test, such as the known mean and spread of scores, any single raw score is completely meaningless. To score 45 on a test might be the highest possible score, the lowest or just average. However, if the average score obtained on all tests by a fully representative sample of children was made, equivalent to 100, then if a child subsequently obtained this score we should need no further information to tell us that his performance was average.

But we do not want merely the average; we also need to select a unit so that distances from the average can be marked off. The unit most usually employed in test measurement is the standard deviation, and it is calculated by determining the root mean square of the deviations of score from their average. The value of the standard deviation of

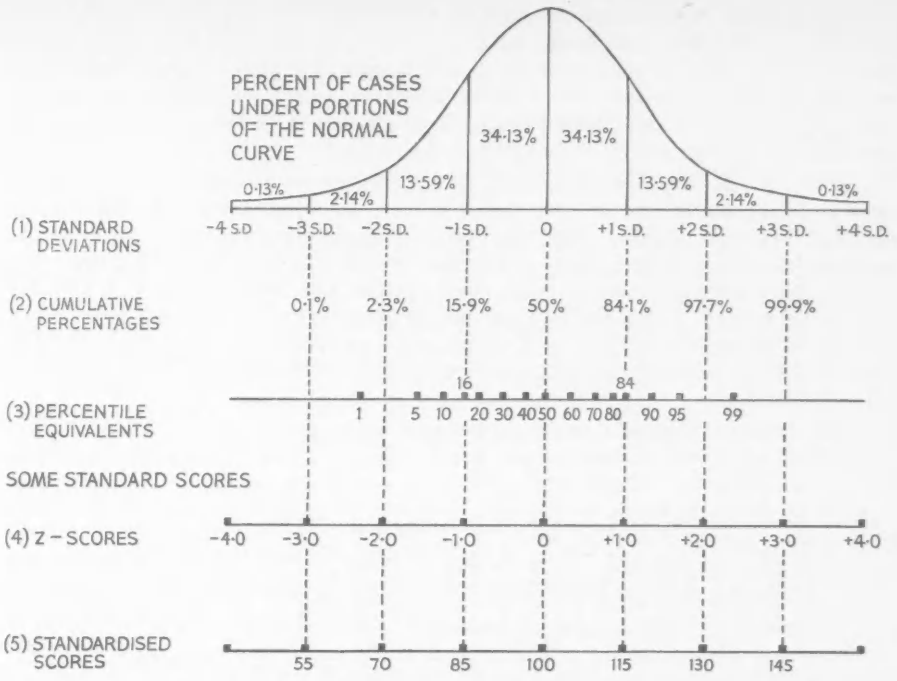
raw scores will, of course, vary from test to test, but, just as it is possible to transform the raw score mean to a scale having an agreed number (such as 100) for the mean, so the raw score standard deviation can be transformed to a scale having an agreed value. The numbers actually allotted on these scales to the mean and standard deviation are quite arbitrarily determined and many scales of this kind, each possessing distinctive features, have been devised. It is, however, increasingly becoming the practice in this country to adopt one particular scale—that in which the mean is 100 and the S.D. (standard deviation) is 15—and this is described in more detail below.

It is necessary first to say a few words about some other types of scale that are sometimes used—namely the mental age, the I.Q. and the percentile rank. The use of the concept of mental age dates back to the first individual intelligence test devised by Binet in 1905. In this test and the subsequent revisions of it the mental age indicates the chronological age at which the test performance is appropriate. Thus a child of 10 may be credited with a mental age (M.A.) of 8 if his performance is appropriate to the average 8 year old. Scores expressed in this way, however, may be misleading if it is assumed that they have some absolute value. It would clearly be an unwarranted assumption that the child quoted above possesses the same mental ability, for example, as another child, also with a M.A. of 8, but with a chronological age of 6! This same concept is equally inappropriate when applied to tests of attainment. Because two children have the same reading age it does not necessarily follow that they require the same educational treatment.

In an attempt to take into account the chronological age of children tested, the mental ratio or I.Q. was introduced. In this the mental age is divided by the chronological age and to eliminate fractions the result multiplied by 100. Thus the 10 year old child quoted above has an I.Q. of 80 while the 6 year old has an I.Q. of 133. However, problems of interpretation still arise. A child of 5 with a M.A. of 6 has an I.Q. of 120; a child of 10 with a M.A. of 12 also has an I.Q. of 120; but the first child is advanced by one year of mental age and the second by two years. Clearly the use of the I.Q. has not eliminated the age factor and indeed an I.Q. should not be used unless it is accompanied by a statement of the age at which it was attained.

Further difficulties in the use of the M.A. and I.Q. occur with older children and adults. The calculation of adult I.Q's. must depend upon the fixing of an adult mental age, but the age at which test scores cease to rise is essentially a function of the test itself, and whereas the highest M.A. on one test may be 12, on another it may reach 20 or 25 years. Also to fix arbitrarily the adult mental age at any point is a contradiction in terms, since by definition the mental age is the equivalent of a mean score for an actual chronological age.

These limitations upon the use of mental ages and I.Q's. have led to their gradual abandonment and replacement by a form of scale in which the performance of any child is compared, not with children of different ages, but with other children of exactly the same age. In order, however, to appreciate scales constructed in this way, it is necessary to consider the properties of what is known as the normal curve of distribution. (See Figure following.)



It was pointed out in Section II that the distribution of raw scores on a test depends entirely on how the test was constructed. It is, however, a relatively easy matter, and for a number of reasons, desirable, to ' normalise ' any distribution, that is, to adjust the raw scores so that they take up the sort of distribution illustrated in the diagram. Any point on the base line represents a particular score and the height of the curve at that point indicates the number of children awarded that score. Thus a large number of children gain scores at or about the mid-point or average of the distribution, and as the extremes of the range of scores are approached the number of individuals concerned decreases. Vertical lines can be erected from the base line at the mean of the distribution and at unit intervals above and below this point. It will be remembered that the unit adopted is the standard deviation, so that lines are drawn on the diagram to represent one standard deviation above the mean, two standard deviations above the mean, and so on, and similarly for units of standard deviation below the mean.

It is now that the properties of the normal curve become clear, because we know the exact percentage of children falling within the limits defined by the vertical lines. It will be seen from the diagram, for example, that about 34% of children whose test

scores conform to this distribution will have a score that lies between the mean and a score equivalent to the mean plus one standard deviation. The same number of children will have scores that lie between the mean and minus one S.D.; 95.4% will have scores between plus and minus twice the standard deviation; 99.7% will have scores between plus and minus 3 S.D., and only a negligible proportion will have scores lying outside these limits.

Row 2 of the diagram gives these percentages expressed cumulatively from the lower to the upper extreme of the range of scores. Row 3 gives the 'percentile equivalents' or 'percentile ranks'—the other type of scale that was mentioned earlier. The relationship between these two rows can be seen from an inspection of the diagram. For example, an individual whose score on a test was one S.D. below the mean is awarded a percentile rank of 16, and this indicates that of the total group concerned 16% will be found to have scores below this level. Similarly an individual whose score is one S.D. above the mean is at the 84th percentile—that is, 84% of the group will have scores below this level.

The method of percentile ranks can, of course, be applied to any form of distribution. If the distribution of test scores is somewhat flattened or skewed to one side because the test was too easy or too difficult for the group taking it, the percentile rank corresponding to one S.D. above the mean, for example, may well be different from the figure quoted above. Also, it should be noted from the diagram, the intervals between ranks are not equivalent all along the scale. In terms of units of test score the difference between the 95th and 99th percentiles is greater than the difference between the 40th and the 50th.

We may now return to what are known as 'standard score' scales. It should be clear now that by equating the average score on a test to zero and adopting the standard deviation of the test scores as a basic unit, the raw scores from any test may be expressed with reference to any scale that is found convenient. For example, if the average score on a test is 48 and the standard deviation is 12, then a score of 48 would be made zero, a score of 36 would be −1, a score of 66 would be $+1\frac{1}{2}$ and so on. Just as with percentile ranks, this system, known as z scores (row 4), can be adopted for a distribution of any shape. Negative numbers are a nuisance, however, and for convenience the mean score is often equated to a large whole number. This is done in the standardised scores set out in row 5. These are obtained by normalising the raw score distribution and equating the mean to 100 and the standard deviation to 15. There is no particular significance in these figures—they were chosen merely because the intelligence quotients derived from adaptations of the original Binet test had a mean of 100 and a standard deviation approximating to 15. Using this scale, a child who obtained a standardised score of 115 would be one S.D. above the mean, that is, he did better than 84% of the population on which the test was standardised.

As was explained in the previous section, it is customary in this country to incorporate a system of age allowances in the process of standardisation. This, however, is not an essential feature of this method of expressing test scores. In other words this method may be used to indicate the relative levels of performance of a specific age group without adjusting for differences of age within it—though for most purposes an age allowance is essential and is now incorporated in the norms of most published standardised tests.

IV. The interpretation of test scores

It is always the aim of a good teacher to understand his pupils—their capabilities, their deficiences and their limitations. The judicious use of the standardised test will assist in that understanding by providing the teacher with a reliable means of assessing his pupils' abilities and attainments and of diagnosing their weaknesses. The interpretation of test results, however, requires much care and thought and it is important that the scores obtained should not be merely accepted at their face value and endowed with a meaning they do not possess.

The first point to be considered in assessing a child's performance on a test is the extent to which the score obtained is subject to error. Most measurements, even of physical characteristics, are liable to error. For example, a weighing machine may be badly constructed so that it tends to give inconsistent results when used on different occasions; again, although the mechanism is faultless it may be poorly calibrated so that the readings obtained are still incorrect; and again, although there may be no error from these sources, it may nevertheless be used incorrectly. All these three sources of error—faulty construction, inadequate calibration and improper use—apply to educational and psychological tests, with perhaps an additional source of error arising from variations in performance of the children themselves.

So far as tests are concerned it is difficult, if not impossible, to distinguish between errors arising from variability in children's performances and those arising from faults in the construction of the test. No test is perfect and the fluctuations in the performances of children are well known to every teacher. Thus the score derived from any test is subject to error, and clearly, then, it would be a distinct advantage if the size of this error could be ascertained. Unfortunately there is no practical way of determining this for an individual, but the margin of error that should be allowed for on the scores from a particular test can be determined. If the hypothetical situation could be considered in which the same test was given an infinite number of times to a child, after due allowance had been made for practice effect, the obtained scores would be found to cluster into a group. In these circumstances it is not unreasonable to assume that the average of these scores is characteristic of the child's performance on the test and what is wanted, therefore, is an estimate of the extent to which the score derived from a single administration is likely to differ from this average or ' true ' score. In practice this estimate is obtained from the measurement of the reliability of the test, and this, it will be remembered, is the consistency with which the same scores are likely to be reproduced on a second occasion, or, in other words, the extent to which observed scores are likely to differ from ' true ' scores. Tests differ in the extent to which a single administration provides a good estimate of a pupil's ' true ' score.

The most convenient statistic for measuring this margin of error is what is known as the standard error of measurement (SE_m), and it is usually quoted in the manuals to good standardised tests. Approximately two-thirds of all scores obtained for a test will be within ± 1 SE_m of their ' true ' scores and approximately 95% within ± 2 SE_m. For example, if a test has a standard error of measurement of 2.5 points (on a scale of standardised scores), then approximately 95% of the observed scores will lie within ± 5

points of their ' true ' score. Another way of saying the same thing is that, with this test, the ' true ' scores of 19 out of 20 children taking it lie within ± 5 points of their obtained scores. In only one case in 20 is the ' true ' score likely to be outside these limits.

So far, only the errors arising from the test itself and the variability in performance of children on it have been considered. A few words must now be said about other sources of error. Errors arising from a faulty calibration of the weighing machine considered earlier have their counterpart in the errors which may arise from an inadequate standardisation of a test. The description given in Section II showed how important this process is, and if the sample chosen for this purpose is too small or not fully representative, errors of considerable magnitude can occur. Again, the manual to a good test will give details of the standardisation and if these are omitted or are clearly inadequate the test should be used with caution. Most of the tests for teachers constructed in recent years in this country attempt to provide norms based upon a fully representative ' national ' sample, so that the performances of children in any one school can be compared with other children in the country as a whole. A truly ' national ' sample is, however, rarely achieved and strictly speaking comparisons should only be made with the standardisation sample quoted. In certain circumstances, for example, a test may be standardised locally (e.g. on children in one city or county), and the norms may well differ from what would be expected in the whole country.

Finally, errors may arise from faulty administration and marking. It cannot be over-stressed that all tests should be given precisely according to the instructions laid down in the manual. Children's performances may be improved if additional words of explanation are given or more time allowed, but comparisons with the established norms will then be no longer valid. Also, despite the relative ease with which an ' objective ' test can be marked, it is surprising how many errors can arise from this source. It is important, therefore, that an independent check be made on all markings.

This foregoing description of the possible sources of error in a test score may appear to be formidable. It is, however, a possible warning against the too literal acceptance of a score as a number with a fixed meaning. Provided tests are administered and marked correctly, and due account taken of the known errors of measurement, the results they give can be of great value.

For a class as a whole they enable a teacher to assess reliably the level of attainment reached and to make comparisons with other classes in the same school, with similar groups in previous years and with other children of the same age in other areas. They are of value too in assessing individual differences and needs, although in this respect the test results must always be matched against the rest of the teacher's knowledge of the child, and any discrepancies that occur elucidated by further investigation. Careful interpretation will enable the teacher of a large class to direct his attention swiftly towards those children most in need of assistance. Finally, of course, the periodic use of standardised tests, by enabling the teacher to express the assessment of his pupils in meaningful form, can be invaluable for passing on relevant information for school records.

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THE TEACHING OF ENGLISH IN SECONDARY SCHOOLS

by Sheila M. Bate

Introduction

"THE teaching of the mother tongue is notoriously ineffective; the incessant strictures on the illiteracy of children and adults are paralleled by the bewilderment of teachers how to overcome it." So wrote M. M. Lewis in 1952. Since then the situation has changed little but rather more publicity has been given to it. The purpose of this article is to consider some of the different approaches to English teaching, to examine some of the reasons for the current dissatisfaction with the general standard of literacy and to consider such objective evidence as we have.

"Illiteracy" is a word which tends to be coloured in its meaning by the prejudice of those who use it. Strictly used, it means a total inability to read and write. In most rigorous research literature it is taken to apply to a condition in which no useful functional skills in reading and writing exist. As Lewis points out, a distinction must be made between absolute literacy and functional literacy; the standards regarded as functional are becoming steadily more rigorous. In the Crowther Report it is used in the functional sense to mean an undefined but presumably marked deficiency in language and communication skills, and to mean deficiency in "all that is conjured by the term 'Humanities'." Thus the words literate or illiterate appear to imply education, or lack of it, in arts subjects. The terms used, "humanities," "deficiency," etc., are not strictly defined at all and appear to refer to fluid, often inconsistent, notions meaningful only in a specific frame of reference. It should also be pointed out that while we may provisionally accept the second of the two Crowther senses because of its relevance to English studies, we cannot take for granted that a knowledge of the humanities is a guarantee of literacy in any of its senses.

One reason for the present problematic situation is probably the variety of notions, mostly ill-defined, about the aims of English teaching. The mechanical skills have almost always been regarded as essential and teaching of spelling, punctuation and the like has often been taken as a matter of course. Literary knowledge has frequently been regarded as the hall-mark of a liberal education, and has been emphasised with varying degrees of insistence. The reports of the Inspectorate in 1906, 1910 and 1924 stressed the importance of literature in schools. The 1921 report of the Board of Education had much to say on the importance of literature in imparting a consciousness of their nationality to children. The Hadow Report of 1926 referred to the value of literature as an interpretation of life, an idea elaborated by Niblet when he says that the aim of teaching literature is to bring to consciousness what is involved in being human. In the Spens Report, 1938, three objectives were recommended to teachers of English: the facilitation of written and oral communication; use of these powers of communication to develop social responsibility in the child; and, ideally, the teaching of literature as a heritage. This last point is cautiously

made and in fact it is recognised that it may not be possible for literature to be taught. In recent years there has been an increasing preoccupation with language, and the fact that the language of literature and the language of the child may be very different things has become officially recognised.

The official reports were influenced by the views of experienced men like Ballard and Hartog, and in turn they had wide influence on teaching practice. The present position seems to be that several different approaches to the teaching of English exist, sometimes within the same school. One approach which is fast becoming obsolete is that which requires all aspects of language to be taught by means of formal academic exercises. Pupils were practised constantly in the whole gamut of formal grammar, in defining isolated words, learning the technical names of rhetorical devices, and similar devices designed to convey a body of information after the pattern of other subjects. In continuous writing the children were exhorted to imitate a style, often the anachronistic mannerisms of Charles Lamb. I. A. Gordon comments that in his experience this approach to writing tends to produce work of a humourless insincerity. In literature the children would be asked to scan, to paraphrase or to analyse Latinisms. The whole emphasis of this kind of teaching was analytic. The revolt, fostered by men like Ballard and Gordon, has been gradual but decisive.

A second approach current in some schools has filtered through from the works of John Dewey and the other ' child-centred ' educationists. The theory was that the child should work at what he wished under the strength of his own motivation. In practice this is not easily achieved in schools with large classes. What may happen is that the structure and aims of the school remain unaltered but a superficial attempt is made to introduce the child-centred way into the classrooms in the hope of winning the child's interest. Thus, an English text-book may contain passages about children of the pupils' own age or people in a town like theirs. The comprehension and vocabulary questions appear under the heading " Quiz-Time " or some such euphemism.

Nevertheless, there was a genuine and considerable modification of the language syllabus; as a result of the steady building up of opinion and the infiltration of views from the United States, English is no longer regarded as a body of facts about grammar, literature, composition and the like, but as the study and practice of the essential skills of reading, writing, speaking and listening, dignified by the name of communication skills, and having as ultimate aim the development of powers of expression in the child. These are skills which may be developed in varying degrees according to the aims of a particular course and the age, ability and motivation of the children. There is as yet insufficient research by means of which we may grade English courses according to level of difficulty and the needs of children at different ages; but evidence is available to help us in this task.

Motivation

In many schools a dichotomy between language and literature still exists. ' Literature' remains the study of a few sacrosanct classics which can be guaranteed not to appeal to the majority of the class, because they are far removed from the interests of the pupils and quite foreign to their linguistic habits. Many grammar schools today no longer enter

pupils for 'O' level Literature papers because of the narrow syllabuses prescribed by many examining boards. Throughout this article literature will be equated with the reading of books, not necessarily classics, and no dichotomy will be preserved between the different skills of reading, comprehension, writing, etc., since these are simply means to self-expression, not ends in themselves.

The prime problem in the teaching of English is one of motivation. The work of A. J. Jenkinson and W. J. Scott has made this position clear. Jenkinson published in 1940 the results of his questionnaire survey of the free-time reading habits of some 3,000 children in the old senior and secondary schools. Scott, in 1947, published in New Zealand the results of his four-year survey into the reading, film and radio tastes of nearly 4,000 high school boys and girls. The general conclusion is that none of these media offers a barrier to enjoyment so long as the material is congenial and the manner of presentation appropriate to the child's level. There is a study by A. R. Williams on the magazine reading of secondary school children which makes comparison with the earlier findings of Jenkinson and of M. Stewart on the leisure activities of school children.

Number of Magazines (i.e. "Bloods" and "Comics") read per week by Secondary School Children, 1930-1940, 1946-1947, 1950

Average number read per child		12+		13+		14+		15+	
		SM	GR	SM	GR	SM	GR	SM	GR
Jenkinson	BOYS	4.2	3.7	4.0	3.0	4.0	2.0	–	0.8
Stewart	BOYS	2.5	2.7	2.5	2.7	1.7	1.8	–	0.7
Williams	BOYS	2.5	2.3	2.5	2.4	2.4	1.9	2.1	1.0
Jenkinson	GIRLS	2.7	2.0	3.3	2.0	4.2	1.3	–	0.6
Stewart	GIRLS	1.8	1.7	1.5	1.3	0.8	0.7	–	0.7
Williams	GIRLS	2.2	1.5	2.1	1.6	1.9	1.5	1.4	0.8
Percentage Reading None									
Jenkinson	BOYS	5.7	11.8	7.3	17.5	10.5	34.4	–	49.1
Stewart	BOYS	10	15	12	20	35	42	–	84
Williams	BOYS	5	21	23	30	14	33	25	55
Jenkinson	GIRLS	16.5	14.0	6.4	14.8	7.5	34.1	–	66
Stewart	GIRLS	14	19	20	31	49	55	–	92
Williams	GIRLS	11	35	15	45	25	43	38	69

(By permission of Methuen)

It is important to realise that " Bloods " and " Comics " are not by any means wholly bad and that within this general class there is a wide variety of reading matter. There are now, as before the war, a number of serious weeklies and monthlies for children and adolescents as well as considerable reading matter of a good level in the children's pages of some daily newspapers. Many of the strictures of *The Seduction of the Innocent* are, however, true; and perhaps truer now than twenty or thirty years ago.

As a result of his survey, Williams concludes that " schools and educationists are not making the fullest use of opportunities for introducing the adolescent to worthwhile reading matter and less exacting forms of literature. A great reserve of reading energy remains untapped which could be used to raise the cultural level of children who are approaching the age at which their formal education is about to cease."

Some at least of the problem lies in the presentation and format. The illustrated paper is more attractive than the bound book; the book illustrated in vivid colour than that which is unillustrated; even Alice found books without conversation and pictures dull; and many book-loving children find descriptions boring.

Beyond all this there is, however, a sociological problem. Hoggart points out in his book, *The Uses of Literacy*, that there is in certain social groups often a hostility and contempt for the prescriptions of the academic elite. The hostility is propagated by the use of the linguistic conventions " them " and " us," which reflect social divisions that cannot be lightly removed. The attitudes learned in early childhood at home prove difficult to eradicate; the attempts of a teacher of adolescents to help his pupils develop values contrary to or decried by the social groups to which they belong are likely to be arduous and may be foredoomed to failure unless he combines outstanding teaching technique with an attractive personality. One thing that a teacher in these circumstances can do is to try to build on existing interests, which usually tend to sex, violence and rhythmic music. In such a process of development the teacher needs to use every medium to hand, and in English often has greater success with more active methods than reading, although reading has an essential part and a valuable one, once motivation is aroused. There have been many American studies on the specific problem of reading motivation, and some of the suggestions are being practised over here. Mersand, in *How to English the Unwilling*, makes the following conservative suggestions: the use of anthologies for different levels of abilities to meet the specific needs of fast and slow learners; the teaching of classics by making them contemporary human documents; and the use of audio-visual aids. Elizabeth Rose, in *Literature in the Junior High School*, suggests that teachers try every means to make children aware of books, by holding book fairs, reinforcing book ownership, encouraging free reading and playing on the children's interests.

Himmelweit's three-year study demonstrates some of the effects of home television watching on reading motivation. Her main conclusions include the following points:

Those children who spend a lot of time watching television naturally read less. Books suffer most; interest in reading comics simply drops from being unusually great to being normal. After a few years, book-reading returns to its original level but loss of comic reading remains. Therefore, she concludes, the proportion of book-reading to comic-reading by viewers increases.

In the interim period, the loss in book-reading is strongest among boys and among children of average intelligence, all those who read little to start with and can ill afford the loss.

Television can, however, extend the range of non-fiction interests, especially among the duller adolescents who most need it.

There is no evidence that television watching changes children's interests in fiction reading on the whole, but those who view may be stimulated to read the books dramatised on television, depending on the type of book and the way in which it is presented.

It is important to remember when interpreting this evidence that much of it is based on the *borrowing* of books by children; but borrowing is in itself no evidence of reading.

In the Modern Schools at least, the main problem is that of arousing sufficient motivation to remedy individual deficiencies in the communication skills; the attempt to propagate a literary tradition is largely anachronistic in this setting. As far back as 1922, C. H. Judd and G. T. Boswell demonstrated publicly what is obvious to every teacher, that enormous differences exist in the speed, accuracy, perception and progress of individual reading habits. Wide differences exist within one streamed grammar school class. Four-fifths of the school population do not attend grammar school classes so that the problem of coping with their individual needs is enormous. An American study by J. R. Squire offers four methods of dealing with this situation: (*a*) to teach one section of the class at a time, (*b*) to introduce a project in which children are given tasks according to their capabilities, (*c*) to assign graded reading work to groups according to difficulty, (*d*) to find some central motivation which will stimulate everybody to read and express himself at his own level. Clearly, all these proposals are fraught with difficulty and depend supremely on the relation of the teacher with the class, which depends on the personalities involved, the traditions within the school, the socio-economic area and the size of the class. Research can provide no simple answer to problems like these; each teacher has ultimately to evolve his own compromise.

Critical thinking

The findings of research can, however, make things easier for the teacher by presenting new ideas and examining old ones objectively. At the present time educationists have the task of assessing the merits of the primary aims of English teaching today and examining the techniques used to foster them. The primary aims seem to be: to develop the power of critical thinking in the child and to develop and encourage the child's powers of expression. J. H. Bens, in his article, " Teaching Literature in the world of Mickie Spillane," suggests that the primary goal of literature should be critical thinking. This, though it would not be accepted by all teachers of English as the primary goal, is clearly very necessary since, when he leaves school, the child will not only be exposed to every conceivable hidden persuader in the commercial world but will be called on to form a political opinion and perhaps to serve on a jury. Jepson, Stebbing and Thouless, in their books on thinking, warn against many of the pitfalls of argument; as they stand, however, these are suitable largely only for sixth form work. What is needed is a graded approach to the techniques of argument and discussion. Dorothy Bagley points out that reasoning

about words should not begin until children are ready for it—probably around the age of fourteen. A beginning, in the realm of formal logic, has been made by E. H. Miller in America. He conducted an experiment with children of sixteen which involved the use of twenty-nine different types of logical fallacy. He found that the most difficult fallacy to detect was arguing in a circle and the fallacy of the undistributed middle term the easiest. He proposed as a result of this that the reasoning processes be studied and age and grade norms be established as they have been for arithmetic and reading. Such work should be reserved for the last years at school, along with the review of formal grammar where this is given.

Seely has said that " the formal review of grammar should be placed at the end of a cumulative learning programme " when " the principles and usages to be formally organised have, for the most part, been practised and understood by the pupils for some time." Gordon maintains that clause analysis has real value as it is a test of the pupil's ability to grasp the mechanisms of his own language. This view is endorsed by the majority of the Examining Boards for ' O ' Level G.C.E. There is no evidence, however, that a knowledge of grammar helps to improve usage, or assists children to understand literature or to learn foreign languages—all claims that have been made for it. The method of analysing sentences diagrammatically teaches pupils nothing about how to use language. Bargahan and Stewart have shown that no transfer results from learning to diagram sentences. Macauley did an empirical study in Scotland in which he found that only the best of junior secondary school children could get as many items right as wrong in a simple test of formal grammar after four years of teaching. The majority of senior secondary school children were also incapable of answering the questions. From this Macauley deduces that it is idle to drill analytic techniques into most children, since the concepts involved are too difficult. Hunter Diack, in his book *The Teaching of English Grammar*, questions this conclusion and suggests that the teaching of grammar still has an important place in the schools. His views are in line with those linguists who emphasise a structural approach, such as that propounded by Fries in *The Structure of English* and Roberts in *Patterns of English*, and sponsored in this country by such men as Bruce Pattison and Randolph Quirk. In *The Teaching of English*, Randolph Quirk argues that more stress should be laid on the function of words in English and less on word types. For example, he argues, we are taught that words which denote activity are verbs, but a word like " taxation " which clearly denotes activity is not a verb. This approach is artificial: language lessons should deal with morphology, intonation, the way inflexions are used and the importance of word order. He supports Fries's notion that a good way to demonstrate the functional nature of language is by using as examples sentences composed of nonsense syllables which incorporate bound morphemes such as -s and -ly, and which demonstrate the importance of word order patterns in English. Such an approach should ensure a detachment from language and an ability to see it as a tool rather than as a master.

Once this groundwork has been done the higher classes can tackle the question of deviation from the general structural norms for various reasons. Deviations in verse or mannered prose are common for reasons of emphasis, form, intensity and the like.

Deviations in inflexion may be justified because they extend the span of meaning and give rise to harmonious stress patterns as in:

" Do not go gentle into that good-night,"

a line which illustrates also deviations in morphology justifiable in puns and other word play. Similarly, deviations from literal meaning in the use of metaphor can also be presented on this principle. There should always be an aesthetic reason for deviations that are in any way extreme. Such linguistic structures and vocabulary as are cited by Sir Ernest Gower in his *Plain Words*, for example, show that officialese is obnoxious because it uses deviant language for extraneous reasons—to browbeat the recipient to take note, for example—and is entirely devoid of real beauty.

There remains the practical problem of how children are to be taught to write grammatically if formal instruction is rejected as inefficient to this end. In the field of applied grammar Bagley suggests that the most frequent errors made by children are those which cause the greatest difficulty. She lists some items of language which have been found to give the greatest trouble to both English and American children in order of frequency. These give some clue as to which items should be concentrated on at the early age levels and which at later:

(1) The sentence as a unit—the complete thought.
   (*a*) the use of the initial capital letter and the final full stop;
   (*b*) avoidance of a series of sentences loosely strung together with " and ";
   (*c*) avoidance of loose participial constructions;
   (*d*) avoidance of vague " so " and " only " clauses.

(2) Agreement:
   (*a*) in number, between verb and subject—especially in the case of the indefinite pronoun subject, e.g. everybody;
   (*b*) in number, between pronoun and antecedent.

(3) Use of the capital letter for proper nouns and adjectives derived therefrom.

(4) The case forms of pronouns—particularly the relative " who."

(5) Verbs:
   (*a*) correct tense forms of verbs—especially irregular and " strong " verbs;
   (*b*) avoidance of the past participle in place of the past tense, e.g. I done it.
   (*c*) correct sequence of tense.

A common method of teaching these things, especially in America, is to try to eradicate errors without formal instruction in punctuation, agreement and so forth. It has been found that proof-reading is a very successful practice test and that individual graphs of progress stimulate learning of these things. But much work remains to be done on the efficacy of transfer to original writing. There is thus good reason for some of the " incessant strictures on the illiteracy of children and adults " in language and communication: there is no method of teaching the mechanical skills which has been found to be particularly efficient. The whole process is still largely hit and miss.

What is clearly to be avoided is the idea that spelling, punctuation and grammatical errors are mistakes only when they occur in the context of the English lesson. For this reason it is essential that every teacher be a teacher of English to this extent at least; in some schools English as a separate discipline has disappeared from the time table, which would seem to be carrying the idea a bit too far; this may be a result of the rather extreme view of the Norwood Report, which comments upon the dangers of having specialist teachers of English. Some cross-reference and co-operation, however, is essential and benefits all concerned. It is particularly useful in developing understanding of vocabulary. Concept formation involves classifying, relating, generalising—all processes which are sometimes short-circuited in that method of teaching vocabulary which necessitates learning the meaning of words in vacuo, fitting names to dictionary definitions and writing sentences to demonstrate the meaning of words met only a few minutes previously. This can be a dangerous practice: many words, such as "freedom," "apartheid," "conservative," "justice," etc., evoke an emotional attitude dependent in many cases on second order knowledge. It is essential that the meaning of words such as these be taught in as many areas of the curriculum as possible if critical thinking is to be a reasonable aim of English teaching.

The close dependence of English comprehension on other areas of the curriculum and on general reading has been demonstrated by Black in a study with training college students. He maintains that the results of this study apply also to children between 15 and 18. Basing his conclusions on the answers to objective tests, he found eight main sources of error. These were: failure to understand the writer's attitude, failure to appreciate irony, lack of knowledge of vocabulary, non-comprehension of allusions, ignorance of the nature of metaphor, lack of background information, failure to note the influence of context, and the intrusion of the readers' preconceptions. These present quite a complex teaching problem since the pupils need to acquire not only knowledge of special techniques but general knowledge and much practice in reading. Studies by Gray and Rogers show that the more "mature" readers had mastered the skills of word recognition, could grasp the meaning and could thus concentrate on evaluation of the ideas and organise them in relevant ways. Artley, in his work on the implications of the Gray-Rogers study, concludes that all areas of the curriculum should contribute to reading maturity. A study by Josephine Piekarz indicates that lower-level readers have difficulty in distinguishing between their own and the author's ideas. They tend also to concentrate on the literal meanings of the words and to give scant attention to implications or make critical reactions.

The practice of precis writing has many advocates because of its presumed value in promoting critical thinking—judgment of the relative importance of ideas and practice in the management of language. Gurrey advocates precis writing strongly, but insists that precis passages should be of use and frequently consist of material from non-school sources, such as *The Spectator*, *Listener*, *Times* and other periodicals which provide a fertile ground for G.C.E. selectors. Most grammar schools will be bound to teach precis because of the G.C.E. requirements, but there is as yet no objective evidence that constant practice brings about increased discrimination. The 1954 Report urges that precis be not taught

to children of thirteen or less. At this age the majority of children are still uncritical and it is important that their enjoyment be left them as long as possible.

Critical enjoyment in the sense of " Appreciation " is a matter for the final years and for sixth forms. It can emerge only after much practice in reading which will provide some basis on which to form a judgment. In this connection Gordon deplores the common practice of training children to assess and appreciate only " good " passages. He has shown that this may lead to failure of comprehension of the worth, appropriateness and functions of a style. He studied candidates' answers to a question on a 1942 University Entrance Scholarship paper which demanded a comparison between two passages: one a publisher's blurb of the worst type and the other a cool, critical piece by Newman. Forty-four per cent. of the candidates thought that the first passage was worth serious consideration and many of these thought that it was fine prose. Similar work has been undertaken by I. A. Richards, whose famous studies in " Practical Criticism " make a similar point on the inability of many undergraduates to form a balanced judgment of an anonymous passage.

Development of Expression

T. W. Irion did some studies with fourteen-year-olds in the United States. He used two prose passages, one of which was narrative, a poem, and a passage of blank verse dialogue from *Julius Caesar* printed as prose. He found that the pupils had most difficulty in understanding the significance of the poetry, had difficulty in making detailed comments on the drama, but could grasp the general significance, and that the prose afforded them the least difficulty. The reasons for this are the unusual nature of vocabulary, the word order and the morphemes to those not thoroughly acquainted with deviations from the norm of plain prose style. There seems little reason to inflict the more extreme linguistic deviations upon the unmotivated and so make their attitude yet more hostile. The primary tendency today seems to be towards making a child's reading and writing experiences relevant to his own mode of living and to giving him ample opportunity to express himself orally. To achieve these aims, a more active approach is necessary than that usual for the development of critical thinking. The supreme exponent of active methods was, of course, Caldwell Cook at the Perse School in Cambridge at the beginning of the century. Using the class as a social unit, he made full use of drama, debates and projects to increase the directly experienced knowledge of the boys. Marjorie Hourd, in her book *The Education of the Poetic Spirit*, shows how dramatization visibly increased empathic understanding in some girls. At many age levels in the secondary school, however, and particularly in boys, there is a strong " fear of feeling " and dramatization or the public expression of any personal emotion becomes often impossible. In some cases a devious expression of feelings is still possible and boys, if permitted, may act out their feelings at a symbolic level, on the Moon or some such stylised place: with the older boys this is no longer feasible. Suspension of disbelief becomes more and more impossible with 14-16-year-olds. In such cases one can encourage expression using active sources of stimulation in conjunction with a permissive environment (*not* an anarchistic one).

For example, it is common practice for schools to send parties of children on visits to theatre productions of Shaw, Shakespeare, Oscar Wilde and non-English dramatists

such as Bertold Brecht. Many schools make use of the B.B.C. radio services for schools and the television services where these are appropriate. Much research remains to be done on the effectiveness of these techniques. Use of special techniques is often a matter of finance and individual opportunity but most schools have school or classroom libraries where periods of free silent reading are catered for in the timetable. These are probably almost indispensable to progress for those children who come from noisy homes or homes where there is little or no reading matter. In all these special activities the boundaries of literature as traditionally conceived have to be extended and much that comes under the heading of history, geography and even science will be included. This is now normal practice: some schools, however, go further in this co-operation and one finds schools which run their own internal radio programmes, make their own films and print their own magazines. This sort of inter-subject co-operation has been explicitly recognized by the Associated Examining Board who, in their A-Level syllabus, include such set books as Hoyle's *Decade of Decision* and Lewis's *The Screwtape Letters*.

Many of these special activities give opportunity for the development of oral expression, an activity long neglected in the majority of secondary schools. Inadequacy in oral communication is a serious handicap today since speaking and listening are much more in demand than writing and reading. In many cases industries are having to set up courses in oral communication to remedy the deficiencies of their employees. Technical Colleges and Teacher Training Colleges are beginning to tackle the problem but ultimately much of the onus will fall on schools. Basil Harvey makes a convincing case for the creation of more ' O ' and even ' A ' level examinations in spoken English.

The problem is much the same in principle as it is in grammar, literature and writing. The primary aim has to be the simple establishing of an appropriate norm; deviations can be developed with students who have time and ability to explore them. In secondary modern schools in poor socio-economic areas, for instance, the aim must first be to instil some measure of proficiency in the prevailing vernacular by means of oral composition of one sort or another. The child can be encouraged to speak in sentences, use phrases not too interspersed with cliches and meaningless expressions, and to adapt his words and tone to his purpose. Later, on an optional basis perhaps, there may be some provision for training him to use a more widely socially acceptable language. Dr. Lewis stresses the need for oral practice to give skill and facility in the interchange of speech. This brings self-respect and confidence, he says, and is a means of securing the co-operation of others. Again, the problem of formal instruction arises and it is probably true to say that rigorous formal training will often create hostility. Many education authorities automatically issue tape-recorders to their schools now and there is no doubt that once children have grown accustomed to hearing their own voices played back after a session of free drama or informal discussion they can be astounded and elated at their own performances.

The normative approach is also operative in the teaching of written expression, which must, of course, be integrated with oral work. Writing for simple factual purposes is one of the main aims of the teaching of written English today, since this is all that the majority of children will be called upon to do when they leave school. This aim is endorsed by such bodies as the Associated Examining Board in their ' O ' Level English papers and

by the Royal Society of Arts. Such questions as " Describe how you would make a bed " or " Describe a vacuum flask as for someone who has never seen one " exemplify the type of work that is encouraged. The choice is unfortunate, since such assignments seem unlikely to arouse a high degree of motivation. In many cases the children practise the sort of work they may be expected to manage in their first jobs, such as writing reports, business letters and announcements. As early as 1921 the Board of Education, writing about Evening Continuation Schools, notes that a " vocational approach " to English was much more successful than the traditional " literary approach " which seemed to be widely detested.

There is another function of written expression, however, just as there is of speaking: that is the function of developing the child's personality. The criteria governing the whole of English language studies have shifted from " What ought the child to know? " to " What will develop the personality of the child? " It is common practice to encourage the child to give expression to personal experiences and feelings in such compositions as autobiographies, letters to friends, narratives or descriptions, depending on the age level of the child. After the age of fifteen, says the 1954 report, " the thoughts of the intelligent turn to exposition and argument "; beyond this age there seems to be a tendency for the expressive needs of the adolescent to be neglected in face of examination pressure. Muriel Kay has done some work with sixth forms in a girls' grammar school on the so-called therapeutic aspects of the teaching of English, work which involved considerable oral discussion, and she claims that the results are beneficial. There is little objective evidence to show that giving expression to personal experiences does develop the personality of the child—the concepts involved are too vaguely conceived.

The importance of this second function of written and oral expression—perhaps particularly oral—cannot be over-estimated. It is suggested that freedom of expression develops personality not in any nebulous way, because it is " good to express oneself," although a few may find relief in cathartic expression; but because, for the most part, for children to express something in their own way and note the results is an essential factor in the " reality-testing " process. The processes by which words and gestures become welded into an individual's style is subtle and devious. Identification is often a forceful one at these age levels; imitation is potent, too; rational instruction, the pressure of group opinions and the way in which rewards and punishments stress components of verbal behaviour are all important factors. Detailed examination of these is, however, beyond the scope of this article.

Conclusion

From time to time there can be observed in educational publications a tendency to project the aims of education as a whole on to the English course—witness the three-fold ideals of the Spens Report—but basically the aims can be restricted to two: the development of language as a comparatively non-social activity, in critical thinking, and, more important, the primarily social aim of developing what may be called the reality-principle in the child, that is, assisting him to maturity. Achievement of these aims is dependent on two factors; the possession of communication skills and the possession of a body of knowledge or ideas, acquisition of which is in turn dependent on motivation. The modern

trends are towards a permissive but guiding environment, active techniques, great emphasis on oral expression and continuous recognition of the fact that appreciation is dependent on enjoyment. This may mean allowing the child to speak, read and write on his own level unharried for a while, even where his performance is below average, in order that enjoyment may not ebb away. Only thus can illiteracy in both senses of the word be diminished.

Objective research still lags; much remains to be done on the effectiveness of motivating techniques, gradations of difficulty within the mechanical skills, and on student-teacher guidance. The fundamental problems of the English teacher will remain, however, since he is not so concerned to impart facts as to provide opportunities for children to develop according to the ancient maxim " Know Thyself "; how this can be done from day to day only he can assess.

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TEACHING ARITHMETIC BY CONCRETE ANALOGY — I. MIMING DEVICES*

by J. D. WILLIAMS.

Introduction

Object

IN the first article in this series, an attempt will be made to classify, compare, and, to some extent, analyse, some of the concrete devices at present available for use in the teaching of primary school arithmetic. In later articles some systems of teaching that entail the use of these devices will be compared, and the rationale supporting such systems will be examined.

This article does not describe all of the devices, or even all of the *types* of device at present being used in schools; for the most part, those devices described are used in the systems that are to be dealt with in the later articles.

It is hoped that this article will bring to the notice of teachers material with which they are not yet acquainted, and, by revealing certain general characteristics of different kinds of device, give a truer perspective of those with which teachers are already acquainted.

The Devices

The sort of material we shall be considering—that used in such teaching systems as the Montessori, Stern and Cuisenaire—consists of what might be called ' concrete analogues.' These analogues represent in concrete form the *elements* of arithmetical operations, and can be used as *miming devices*, with which to parallel, or ' mime,' derivative arithmetical operations. Using these, it is possible to present arithmetic, not in its usual symbolic form, but in a concrete form that is thought to be more intelligible to the child. Such devices should not be confused with the following:

(1) Apparatus (coins, etc.), such as is used in *environmental teaching*.

Real-life situations can sometimes very accurately depict arithmetical operations in a concrete form that is very readily understood by the child: e.g. Joe will understand perfectly that if he shared a cake with four other children, he would get a smaller piece than if he shared it with only *two* others, whereas he might be puzzled that $\frac{1}{5}$ contains a larger number than $\frac{1}{3}$, but represents a smaller fraction. The use of such situations differs from the use of our concrete analogues in some important respects:

(*a*) Real-life situations are complicated by many irrelevancies, which often obscure or distract from the arithmetical relationships to be depicted.

*The distribution of teaching methods using some of the apparatus described in this article is given in 'Distribution of Methods of Teaching Arithmetic in Primary Schools in England and Wales' by J. B. Biggs in this number of Educational Research.

(*b*) Any one such situation is not likely to depict more than a fragment of the arithmetical system.

(*c*) Although, with the use of a great many real-life situations, it should be possible to depict a great deal of arithmetic, these situations taken together would not present a coherent whole of a sort that would illustrate the interrelatedness of the arithmetical system.

In order to exclude mathematical irrelevancies, to cover the essentials of mathematics and to show their interconnections, it is necessary to *devise* situations that reflect as precisely as possible the *fundamental elements* of arithmetic, and that can be manipulated in ways that will parallel the arithmetical manipulation of these elements. To a greater or lesser extent, the devices to be described fulfil these requirements.

(2) Mathematical models.

Much of geometry is devoted to the description of spatial arrangements that are difficult to visualise or to depict on paper. Often, therefore, models are constructed as instances of particular mathematical descriptions. Such models are essentially different from the devices that we are concerned with. These models are *mathematically complex*. They are *not* constructed to mime *fundamental* processes in mathematics as are our analogues, and, consequently, they cannot be used to parallel such a diversity of *derivative* processes.

Spatial Depiction

In the case of *most* of the devices to be described in this article, mathematical operations are depicted *spatially*. Since at its origin mathematics was probably devised largely to parallel such spatial aspects of the environment as groupings, arrangements and sizes, it is no coincidence that such spatial aspects can be used to parallel mathematics. Many of the rules according to which objects can be manipulated and arranged have become very familiar to the child in the course of his daily commerce with the environment, and in terms of these he can learn to understand those rules that govern the use of mathematical symbols.

However, not all of our devices are concerned with arrangements and sizes of objects, and those that are not are less immediately intelligible to the child. The balance, which will be described later, certainly parallels many mathematical operations, but the rules according to which it, itself, operates, must be learnt and accepted by the child before this device will help him to understand mathematics. Again, Cuisenaire's colour representation of number must be associated with a spatial representation before it becomes intelligible to the child.

Since we shall be considering mostly *spatial* devices, we shall first examine some features of the arrangement of objects—for certain of these features are obvious determinants of the scope of spatial representation.

Grouping and Measuring

One could depict a great deal of mathematics using no more elaborate a device than simple groups of objects: the cardinal properties of number could be represented by the number of objects in a group, the ordinal properties could be represented by giving

objects a numerical significance according to their position in a linear arrangement, and the relation between cardinal and ordinal properties could be represented by arranging groups of objects in order of size of group.

However, the devices that we shall be considering are more than just groups of objects, for they make use of *units*. This means that the objects in the groups are all *spatially equivalent*, so providing a visual cue that tells us something about the size of a group even if we do not count its members. See fig. 1.

(*a*) Depicting equality without spatial equivalence of units.

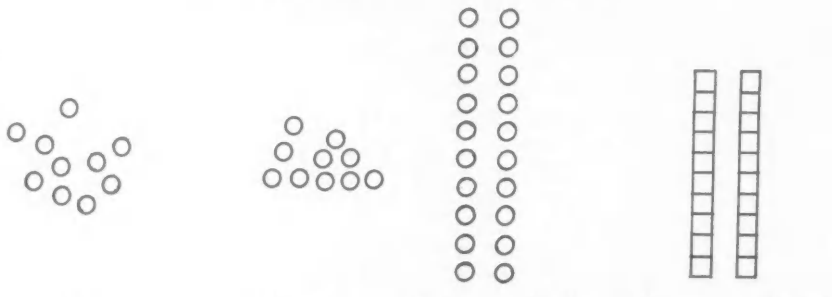
(*b*) Depicting equality *with* spatial equivalence of units.

FIG 1

Thus, using spatially-equivalent units, we can represent numerical size by physical size.

But even though we have units, we cannot get more than a *rough* impression of the comparative size of large groups unless we can arrange these units in such a way that those of one group can be *matched* with those of another. A simple way of doing this is to arrange the units at equal distances from one another in a straight line. Where the units are pegs, this arrangement can be ensured by using a pegboard whose holes are equidistant and in straight lines. Where the units are cubes, these can be juxtaposed. Such an arrangement of units simplifies considerably the business of comparing the sizes of different groups, for now the groups can be *measured* against one another, as shown in fig. 2.

COMPARISON OF TWO GROUPS OF SPATIALLY-EQUIVALENT UNITS



(*a*) When units are unaligned

(*b*) When units are aligned

FIG 2

In (*b*) it can be seen at a glance that Group 1 and Group 2 are exactly equivalent, while in (*a*) their exact equivalence would not be recognised without counting.

Subgroups and Dimensions

We now have a much clearer way of representing relative size, but we can go even further than this, and use a strategy that will enable us not only to represent this even *more* clearly, but to depict numerical relationships of a more advanced kind. This is the strategy of *subgrouping*. There are two advantages in subgrouping:

(1) The numerical qualities of large groups cannot be visually appreciated so readily as can those of small groups. Thus, ooo ooo ooo is clearly three groups of 3, whereas oooooooo is by no means so clearly 9.

(2) It is often possible to express mathematical relationships more fully by subgrouping. Take $6 \times 2 = 4 \times 3$. This could be expressed thus: oooooooooooo = oooooooooooo, but could be expressed much more informatively by: oooooo oooooo = oooo oooo oooo.

We still have not fully exploited the possibilities of spatial representation, for, so far, we have been grouping units in only *one* dimension. *Three* groups of 3 objects can readily be appreciated when arranged in a line, but what if we had *nine* such groups? For example: ooo ooo ooo ooo ooo ooo ooo ooo ooo. In this arrangement, the number of subgroups is too great to be appreciated visually, and if the objects used were of any size they would be difficult to arrange in this manner on a desk, and certainly difficult to see as a whole.

Let us now bring in another dimension, and arrange the units thus:

ooo ooo ooo
ooo ooo ooo
ooo ooo ooo

This two-dimensional arrangement simplifies the visual representation considerably, for we can now see at a glance that we have three groups of 3—that is, 9—and we can also see that we have this three times—making 27.

But say we had 81 objects. If we confined our structuring to two dimensions we should again be in trouble, for again we should have *nine* groups to manage, each, this time, containing 3×3 objects.

Hence the usefulness of a *third* dimension, enabling us to reduce this number to three groups. In fig. 3 there are 81 objects divided into what are very obviously three groups, each of which is divided into what are very obviously three subgroups each of which is divided into what are very obviously three *sub*-subgroups each of which contains three objects. In this case we have used cubes as our units, for these are easier to draw.

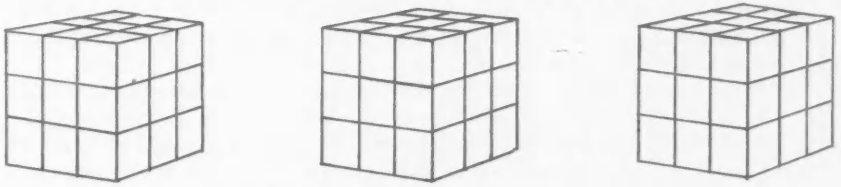


Fig 3

We have seen that grouping can help to depict a multiplicative relationship, and since

the use of extra dimensions facilitates grouping, we can expect that the more dimensions we use, the more multiplications we shall be able to express. Thus, in one dimension we might have Y groups of Z objects, in two dimensions X groups of Y subgroups of Z objects, in three dimensions W groups of X subgroups of Y sub-subgroups of Z objects. If, then, our device will allow us to use all three dimensions, we shall be much more conveniently able to express a multiplicative relationship involving many terms. Not all of the devices to be described can conveniently be used in three dimensions.

The Abacus

This is usually a frame supporting several wires each bearing ten counters. As shown in the diagram, the counters on the first wire represent units, those on the second, tens, and so on. Counting is represented by moving counters from one end of the wire to the other. In fig. 4, one hundred and twenty-seven has been counted.

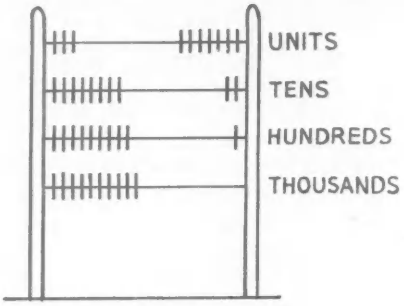


FIG 4. AN ABACUS

When ten counters have been moved on one wire, they are returned to their former position, and one counter is moved on the wire representing the next order of ten.

This device, *within each order of* 10, represents numbers by numbers of objects, thus making the counting process more intelligible to the child. It also enables the child to practise working in tens and hundreds at an age at which he would probably be incapable of doing so on paper. However, it has the following disadvantages:

(1) When adding, say, 5 and 8, the child will be able to move 8 beads along the wire and see what these add up to, but will not be able to see in front of him the 5 beads he is adding to the 8; as a consequence, it is possible that he will carry out his adding blindly, without an appreciation of the quantitative significance of the numbers he adds.

(2) Although one counter on the tens wire is equal to ten on the units wire and one on the hundreds wire is equal to ten on the tens wire, this difference in value is not physically represented by a difference in size, and this will allow the child to forget the difference in quantitative significance of the different wires.

A variant of this device that attempts to represent physically the quantitative difference between tens and units is the Leighbridge Counting Frame. This has only two wires, one bearing big beads, representing tens, and one bearing smaller beads,

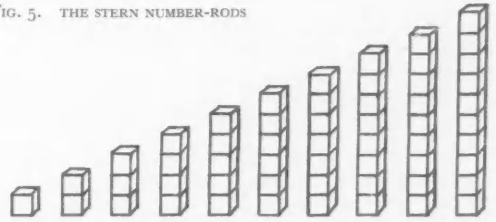
representing units. However, although this makes it clear that tens are worth more than units it does not demonstrate *how much* more, and, of course, although it enables the child to substitute a ten for ten units, it does not allow him to *construct* a ten out of ten units, as do some other sorts of apparatus.

In the Montessori Abacus the counters on the units, tens and hundreds wires are respectively green, blue and red, and so are those on the 1,000s, 10,000s and 100,000s wires. Since this colour scheme is also used to represent orders of ten in some other Montessori apparatus, it will serve to remind children of the difference in quantitative significance of the different wires. In Montessori teaching, this abacus is used only when the teacher is sure that the pupil realises the quantitative significance of difference in orders of ten, and is ready to appreciate a symbolic representation of this difference in terms of colour and position.

Number Lengths

These are devices in which numerical size is depicted by at least the length of the object. The Stern number-rods, an example of this sort of device, are shown in fig. 5. Number-lengths differ in many respects, and we shall consider them under the headings of those respects in which they differ.

FIG. 5. THE STERN NUMBER-RODS

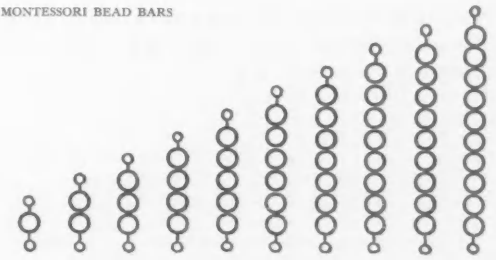


Shape

(*a*) *Multiples of a unit cube*

Many number-lengths are multiples of a unit cube. The Stern, Cuisenaire, Unifix and Dienes are like this. These have the advantage that they can be structured in three dimensions with equality of unit-value in all three dimensions. Thus, X^3 or $X \times X \times X$ could be structured so that X would be represented in the same way each time. The Montessori number-lengths, shown in fig. 6, are composed of small spherical beads and can be similarly structured in three dimensions.

FIG. 6. THE MONTESSORI BEAD BARS



(b) Multiples of a unit square

Some number-lengths are multiples of a unit square. The Montessori addition strips and the Arnold measurement stair are of this sort. Since these are flat, it is easy to superimpose one upon the other, see fig 7. This facilitates the measurement of one in terms of another, and the illustration of differences and ratios.

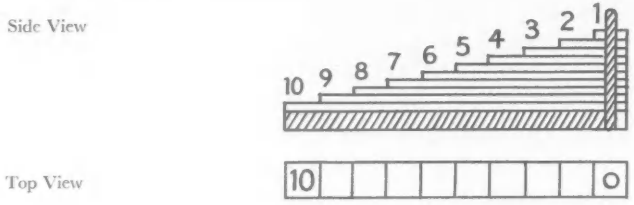


FIG. 7. THE ARNOLD MEASUREMENT STAIR

(c) Others

The Montessori number-rods are in multiples of units that are square in cross-section and oblong in side.

The Shaw number-lengths are cylindrical structures that are multiples of cylindrical " number-pegs," of which the diameter is larger than the height; see fig. 8.

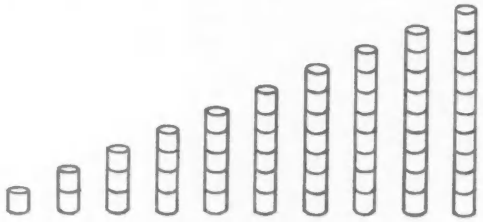


FIG. 8. THE SHAW NUMBER-RODS

The Avon equivalent to number-lengths consists of multiples of unit squares, each bearing a dot, arranged as shown in fig. 9, so as to form a pattern for each number, as well as to represent quantity by size.

FIG. 9. THE AVON NUMBER-PIECES

Size

The Montessori number-rods are the largest, the unit length being 10 cms.

The unit length of the Stern and Unifix is $\frac{3}{4}''$, the Arnold measurement stair, 1″, the Shaw, $\frac{1}{2}''$, the Cuisenaire, 1 cm., and the Dienes, almost 1 cm. The unit squares of the Avon apparatus are of side 1″.

Since the Dienes apparatus includes lengths of only 1, 3, 4, 5, 6 and 10, and these are constructed of units roughly the same in size as the Cuisenaire units, the Cuisenaire rods could be used to supplement the Dienes apparatus for more elementary work.

Because they are so large, the Montessori lengths are suitable for use with very young children. Of the others, the larger lengths have the advantage that they can be more easily manipulated by children than the smaller ones, and are easier to see in class demonstrations. On the other hand, larger lengths take up more room, of course, and when the child is working with larger numbers on the limited space provided by a desk, the smaller lengths are at an advantage. Again, many structures which could be appreciated in their entirety when constructed out of small pieces, would be too large to be " taken in " at one glance if constructed out of large pieces.

Some lengths structure vertically—others more conveniently structure horizontally. The advantages of vertical structuring are:

(1) The structure can be used for teachers' demonstrations.
(2) Less room is taken up.
(3) Rows of rods can be arranged behind one another without smaller rods being obscured by bigger ones, as they would be if they were laid on top of one another. This facilitates comparisons of relationships and the setting-out of arithmetical examples in rows, as they are set out on paper.
(4) By using another dimension, the units in a structure can be grouped in an extra way. This reduces the number of units to be apprehended in any one dimension, and thus produces a terser visual presentation. See the introduction for a fuller account of the advantages of three-dimensional representations.

The Shaw rods structure vertically, and peg into a base and into one another to form a very stable structure. Unifix rods can also be structured vertically with great stability, for these can be pegged into one another. In the case of the other devices, vertical structuring is more difficult but not impossible. The Stern and Avon lengths can quite successfully be structured in a near-vertical tray.

An advantage of the Unifix rods is that they can be so stably structured that composite rods can be manipulated in any position without falling apart.

Segmentation

The Cuisenaire rods are not segmented into unit lengths, so the child is unable to perform his calculations by counting. Take the sum $3+4=7$. With the segmented lengths the child might find that a 3-length and a 4-length equal a 7-length by counting the segments of the 3 and 4-lengths and seeing whether he reached the same number as when counting the segments of the 7-length. This would prevent the child from seeing that *the entity* 3 plus *the entity* 4 equals *the entity* 7.

However, segmentation does have its advantages, for it

(1) enables the child to judge much more quickly the value of the lengths he is manipulating;

Comparative Summary of Devices used in Different Systems

	Shaw	Stern	Unifix	Avon	Cuisenaire	Montessori	Dienes	Lowenfeld	Bass	Arnold
Abacus.						Value indicated by colour.				Value shown by size.
Number Lengths.	Cylindrical vertically-structured.	Wooden blocks.	Vertically or horizontally structured. Components attachable to one another.	Flat pieces 2 units wide, bearing one dot per unit.	Units not marked on rods, which have colour values.	Large wooden blocks and small bars of beads.	Lengths not provided but can be constructed with M.A.B. pieces.	Lengths not provided but can be constructed.		Measurement stair of flat numbered pieces.
Containing and measuring devices.	Base with two rows of 10 holes divided by groove.	Trays holding squares of numbers from 1-10 and 20.	Container divided into five 20-unit channels.						Counterplay board.	
Number-stairs.		Number-stair holder.	Number-stair holder. Number boats.							
Number tracks.	Bases can be juxtaposed.	1-100 track with units marked.	1-20 track with 1-10 track joined.	Number channel with tens marked.						
Positional notation.	Tens and units card.	Dual board holding 10 tens.	Holds only 5 tens.	Holds only 9 tens.			Teacher constructs own.			

Charts, etc., for measuring.	Multiplication Chart and 100-Chart.	Multiplication Machine.				Multiplication board. Addition strip board.			Convecta board.	
Number Patterns.		Pattern Boards with pits for cubes.		Patterns on Number-pieces.		Patterns formed out of counters.				
Pegboards.	Pegs structurable vertically.					Pegs have colour value. Division Board.	For use in A.E.M.			
Fraction devices.		Fraction plates and frames.				Insets, skittles, and device for decimals.		Pieces showing *shapes* of fractions.	Convecta fraction board.	Keighley fraction board.
Balances.							For use in A.E.M.			
Devices illustrating powers.		Grooved wooden blocks to base 10.				Joined beads to base 10.	Grooved wooden blocks to various bases.			
Some devices for illustrating algebra and geometry.					Geoboards.	A variety of devices including flat shapes.	A.E.M. apparatus including triangular and rectangular slabs of wood.	Shapes, areas and volumes demonstrable.		

NOTE: (1) Systems often make provision for operations, without using specially constructed devices, so this table does not reflect comparative comprehensiveness.

(2) " Unifix " refers to a *set of materials* rather than a " system," and " Arnold " to the *supplier* of certain devices.

(2) provides opportunity for the child to realise that end products can be reached by counting as well as by combinations of groups;

(3) is useful when depicting many multiplicative relationships. For example, the commutative law can be illustrated by three segmented lengths arranged in these two ways:

FIG. 10

Because of the segments this can be seen equally well as three rows each 4 units long, or four rows each 3 units long.

Colour

The Stern, Shaw, Unifix, Montessori and Cuisenaire number-lengths all have different colours for different lengths. However, in all but the Cuisenaire, the colours are used merely as an aid to discriminate between different lengths—to give a clearer picture of where one begins and another ends when two are placed end-on, for example.

In the case of the Cuisenaire rods, colour is of central importance. The unit is white and the 7-rod is black, but the other rods are grouped in colour families: the red family (vermilion for 2, crimson for its double, 4, and brown for the double of that, 8); the blue family (light green for 3, dark green for its double, 6, and blue for its treble, 9); and the yellow family (yellow for 5, and orange for 10). Pupils learn to associate the colour with the length and numerical value of each rod, and commit to memory such facts as " black minus red equals yellow." Thus, a sort of " colour notation " is learnt. This is held to be easier to grasp than the usual number symbols, because children are already familiar with colours, and these form an actual perceptible characteristic of the number-rods. Further, the colours constitute a means of grouping related numbers into families.

Unfortunately, these colours are not intrinsically analogous to the numbers they represent—unlike spatial devices, they have no characteristic such as size to parallel number operations, and children might well carry out operations with colours without an awareness of the mathematical significance of these operations.

The Dienes and Avon pieces are not coloured, but it is possible to discriminate between the Avon pieces by virtue of the number of dots on each, and the difference in shape of odd and even number-pieces.

Numbering

All of these devices excepting the Cuisenaire and Dienes have numbering and measuring accessories, but most of these are in the form of containers or cards. However, the Avon and the Arnold Measurement Stair have the value of each length written on it, and the values of the Unifix lengths can be attached to them.

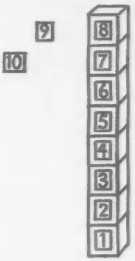
The Avon pieces have large blue numbers on their backs, and this enables the pupil not only to identify each piece with its number, but to use pieces for measuring others. This is done by simply inverting the measuring pieces and covering the pieces to be measured with them; see fig. 11.

COMBINATION OF PIECES

PIECES MEASURED BY COVERING WITH INVERTED PIECES

FIG. 11

NUMBER INDICATORS



ORDINAL NUMBER TABS

FIG. 12

There are " Indicators " that can be attached, if required, to the ends of the Unifix rods, as shown in fig. 12. However, these prevent the attachment of another rod to those ends. Again, " Ordinal Number Tabs " may be attached to and removed from the sides of the Unifix cubes. These can be used to facilitate the appreciation of the ordinal properties of number.

The Arnold Measurement Stair has numbers at the end of each number strip.

It should be noted that in these devices, the use of numbers is optional. The Avon pieces need not be inverted, the measuring stairs *can* be inverted, the Unifix numbers need not be attached.

Accessories for Containing and Measuring Number Lengths

These accessories have three sorts of function:

(1) They serve as a guide and an aid to certain operations that are performed with the number pieces.

(2) Some provide a *spatial* indication of the result of a structuring—in terms of whether or not the structure fits the container.

(3) Some provide a *symbolic* indication of the result of a structuring—in terms of the number on a measuring device with which the structure coincides. In these ways the accessories enable children to do much more of their work by themselves and to discover immediately the results of their efforts without appeal to the teacher. Younger children will need the sort of spatial indication of results that is provided by the various Stern trays, but older children will be greatly helped by the symbolic indication provided by the Shaw cards.

We shall consider these accessories under seven headings.

1. *Simple Number-Containers*

The simplest of these is the Stern unit box, which is a shallow square tray, 10×10 units. By arranging blocks in it, the composition of 10 can be illustrated. A staircase of blocks can also be arranged in it. The Stern number cases are smaller square trays like that shown in fig. 13, in each of which can be shown the composition of one of the numbers up to 10. There is also a Stern 20-case, which is divided in the middle to form two 10×20 unit compartments, in one of which numbers up to 10 can be blocked out, and in the other of which numbers up to 20 can be represented.

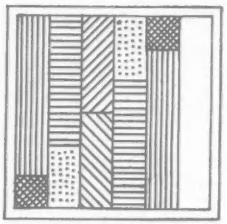


FIG. 13
THE STERN 6-CASE, SHOWING THE COMPOSITION OF 6

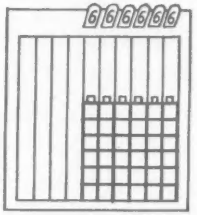


FIG. 14
THE UNIFIX TRAY SHOWING 6×6

The Unifix 10×10 number tray is divided into ten 10-unit compartments. As shown in fig. 14, number indicators can be placed at the end of each channel to show how much it contains.

These channels are of great use in comparing different operations, and enable the child to build a stable structure in less than the whole of the tray; also they help to hold the rods firm while these are being structured vertically. The Avon apparatus, shown in fig. 15, has five of such channels.

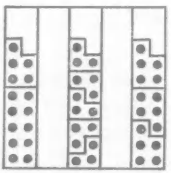


FIG. 15
THE AVON BOARD, SHOWING TWO INTERPRETATIONS OF $15 \div 3$

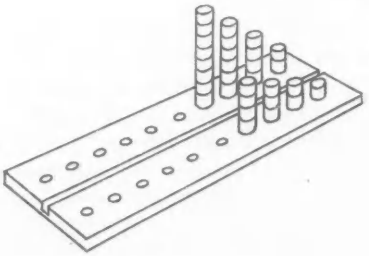


FIG. 16
THE SHAW 20-BASE

The Shaw container is a base with two rows of 10 holes and a groove between the rows into which cards may be slotted. Number-rods and pegs plug into these holes. Several of these bases may be combined to form a larger base. Because of the vertical

structuring of the Shaw rods, rows of structures can be arranged behind one another for comparison, as they are in fig. 16. This, of course, is also possible in the case of the Unifix materials, for these, also, can be structured vertically.

2. *Number-Stair Holders*

These consist of a series of 10 grooves, from 1-10 units long, arranged in order of size. The size of each groove is indicated at one end. Number-lengths fit into each of these to form a number-stair. This device is included among both the Stern and the Unifix materials. The Stern version is shown in fig. 17. The Unifix number-boats, separate containers to fit each rod, can also be arranged to form a number-stair similar to the permanently structured one.

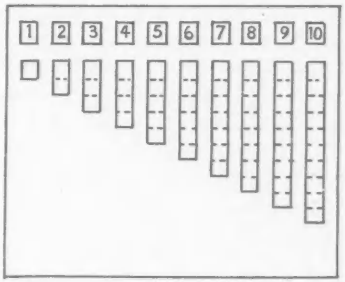


FIG. 17. THE STERN COUNTING BOARD

This device is particularly useful for relating the ordinal aspect of the number rods (their position in the series) to the cardinal aspect (the number of units each contains), but can also be used in *many* operations in which a device is needed for checking and giving a number to a rod or rod-composition.

Editorial Note: Owing to lack of space in this issue, the remainder of this article will be published in Vol. III, No. 3, June 1961.

The author would be grateful for any information about variants of the materials described, or other kinds of material. Please address communications to J. D. Williams, N.F.E.R., 79, Wimpole Street, London, W.1.

STUDENT GUIDANCE IN TECHNICAL EDUCATION

by F. Barr

(Huddersfield Training College for Technical Teachers)

Introduction

DESPITE a large measure of common agreement about the importance of technical education, the problems of technical colleges are less well understood than those of other sectors of our educational system. Teachers and parents, for example, warmly debate the 11-plus selection procedure, the relative merits of tripartite and comprehensive forms of secondary school organisation and even the choice of, for example, the look-and-say or phonic methods of teaching young children to read. Few, however, would be prepared even to explain the meaning of terms such as " joint apprenticeship scheme " or " part-time day release." Most parents have decided views upon the type of secondary school they would like their children to attend; few would care to advise them on a choice between a national certificate or City and Guilds course in a technical college. Almost the only fully discussed problems of technical education are the need for greater numbers of better technical personnel of all grades and the failure of large numbers of technical college students to complete their courses successfully. It is, therefore, worthwhile having a look at some of the problems facing young workers in their choice of courses of further education and studying any such information we have which may suggest how effectively such choices are made and how they might be improved.

Levels of Failure

Perhaps the clearest indication that some improvement is essential is to be found in the figures for wastage or failure. Broadly, the proportion of those who enter on a given course and who either fail the terminal examinations or withdraw before completing it gives some clue to the effectiveness and realism of the initial choice made by the students—even though, as Jenkinson has pointed out, a course is not necessarily wasted if a student does not gain a certificate or does not complete it in the minimum time.

Among those concerned with technical education, there is a general impression that failure and frustration (among staff and students) are higher than elsewhere in our education system. We need to know what the actual rates of failure and withdrawal are and we must ask whether these are endemic, or simply the results of particular circumstances—for example, a bad batch of students suffering from the wartime and post-war dislocation of education—whether they are local or restricted to particular courses such as engineering, building or commerce.

Wastage figures from various parts of the country referring to several groups of studies have been reported. The most complete figures from pre-war days are those cited by Emms. He found that throughout the country in 1938-9, of the students of general building, 35% left between the first and second year courses, 40% between second and

third year, and 52% between the third and fourth years. He noted that this degree of wastage had the result that 13% only of the original first-year students remained to enrol for higher national certificate courses. Post-war reports show similar high levels. In 1955, Jenkinson reported from a college in the industrial north-west that of 171 students of first year ordinary national certificate mechanical engineering, only 10 passed higher national certificate in the minimum time of five years. Smith and Wilkins found that of the 326 students in the commerce department of the Mid-Essex Technical College at Chelmsford, at the beginning of the first term of a new session, 80 (25%) had made no attendance during the first three weeks of the second term.

Not only are similarly high levels of wastage recorded in several parts of the country and in different college departments over a period of years but they have been found at various levels of study within Colleges. Boyce, for example, notes that more than half the classes at the secondary school level in the commerce department of the Welsh College of Technology at Cardiff had a withdrawal rate of over 50%; at the intermediate level over two-thirds of the classes had a withdrawal rate of 30%; and at the university level about three-quarters of them had a rate of 30% and over.

There are differences, too, in the levels of wastage according to whether classes are held in the evenings or during the day. Brosan found in Willesden Technical College that wastage rates in the evening classes were twice those of the day classes. He adds that, as a whole, the rates varied from 42% for the first year classes to 5% in the fifth and final years. Information from a somewhat different source, this time an industrial Apprentice School, confirms these technical college conclusions, for in a study of both City and Guilds and national certificate courses between 1951 and 1956, covering all levels of work, Liepmann found failure rates varying widely from 14% (second year Intermediate City and Guilds course for 1953-4) to 75% (fifth year Final City and Guilds course for 1952-4).

Perhaps the most comprehensive information is given by an investigation undertaken for the Crowther Committee. An analysis of the results of 5,786 national certificate students of engineering, building, science and commerce showed that only 26% of entrants passed the ordinary national certificate and only 10% the higher certificate. Of 2,977 students enrolled in City and Guilds courses covering a wide range of crafts, only 28% passed the Intermediate (three-year course) and 6% the Final Certificate (requiring two more years of study). The enquiry showed, too, that of the original first year national certificate entry, only 21% remained in the third and final year before the ordinary national certificate is taken, and this is reduced to only 3% by the fifth year when the higher national certificate is sat.

For comparison, these levels should be set against wastage rates in grammar schools and universities (where, of course, conditions are much more favourable). The Ministry's report, "Early Leaving," indicates that between 10% and 15% of grammar school children withdraw before sitting the G.C.E. 'O' examination. Jenkinson cites a wastage rate of 15% for English universities. We might also recall that the large majority of fifteen-year-old children never enter any form of further education after leaving secondary school; and this is perhaps the biggest wastage of all from the educational system.

However we look at it, and whether or not we are agreed that all or most adolescents should continue in some form of vocational and educational training after the end of compulsory schooling, it is clear that the high proportion of those who begin but fail to complete such courses is disturbing. It represents a waste of hopes, and of effort, a waste of potential skill and possibly a seriously uneconomical use of teaching resources. No major research of a national kind* has as yet been devoted to finding out why the failure rates are so high and how they might be diminished. But even a cursory analysis of what we do know suggests some at least of the reasons.

Some Possible Reasons for Failure

Complexity of Courses and Examinations

Technical colleges provide a wide variety of courses, ranging in level, from secondary school to university; in content from architecture and astronomy to zoology; and in purpose, from those which are strictly vocational to those mainly concerned with the use of leisure, such as handcrafts and gymnastics. Students of all ages may attend these courses so that within the same college, and not infrequently within the same class, will be found younger and older people from the mid-'teens to the mid-fifties or older. If we leave aside the leisure-time courses, vocational subjects are frequently organised into several departments of which the various forms of engineering—electrical, mechanical and production—applied science, commerce and building, perhaps account for the largest proportion of students. Within such departments there is a major subdivision between those courses preparing students for national certificates and those which give a mainly craft training leading in general towards a City and Guilds of London Institute certificate. We cannot deal with all these varieties of levels and kinds of course individually. Hence we will, at this stage, narrow the focus of attention and look at, as an example, the national certificate courses more closely. This will permit us to expose the hurdles which students must overleap to complete the course successfully.

Most students who attend these courses are released by their employers on full pay for one day each week, and, in addition, may have to attend some evening classes. The course involves sustained attendance for three years if they wish to sit for the ordinary national certificate, these annual sessions being known as S1, S2 and S3 respectively. Some, by virtue of holding satisfactory G.C.E. 'O' qualifications are exempt the first session and may enter S2, whilst others who are not of S1 entrance standard may be required to take a preliminary year's course. After being awarded an ordinary national certificate at about the age of nineteen years, a student may continue to study for a further two annual sessions, A1 and A2, for a higher national certificate and thereafter for further sessions if he wishes to add, for example, to his N.H.C. in mechanical engineering, qualifications in another branch.

Even in the early stages, students must be careful to choose the prescribed combination of subjects, which all adds to his difficulties of choice. This is further complicated by the requirements to be fulfilled before the certificates are awarded. As several of the reports considered refer to students who studied between 1947 and 1955 we may take Foden's

* There is, however, an extensive and large scale investigation of student placement in one large technical college conducted by Dr. E. Venables, Nuffield Research Fellow, Institute of Education, Birmingham.

account of the examining structure published in 1951. The examinations set at the end of the S1 and S2 sessions are prepared and marked by college staff or a local examining body. At the end of the S3 year the papers to be set and the scripts themselves are subject to the scrutiny of assessors appointed by the Ministry and the professional organisation or institution concerned. Both of these have the option of putting questions of their own as substitutes for up to 40% of the total number of questions set. They are empowered also to make up to 40% of the total number of questions compulsory. Finally, they assess the scripts. Moreover, during each year each student must have a 60% attendance record and have obtained 40% of all possible homework and classwork marks during the final year as well as 40% of the examination marks. The latter are weighted in the final assessment of marks to account for 70% of the total of which the student must have obtained at least 50%.

It is evident from this that a student may have to repeat a whole year's study if he fails in any part of the session's work in any part of the examination or if he does not attain the 60% attendance. Elliot found that of 1,874 students in a preliminary course, 348 had to repeat it and eventually only 49% passed into the next, S1 year. Venables, however, noted that if students who had failed in one subject only in the first year examinations had been allowed to enter the second year the wastage rate would have been cut by half to 22%. Jenkinson reported in 1955 that of 69 students who gained higher national certificates in 1952, 53 and 54, only 41 had passed through the course in minimum time. A tribute to the persistence of some technical college students is revealed by his further remark that of this group, 11 failed once, 8 twice, 7 three times, 1 four times and 1 five times (that is, this last student took ten years to complete a five-year's course; had he been a grammar school pupil he would have passed his G.C.E. 'O' level not at sixteen years but at the age of twenty-one). Hutton also discovered a similar persistance among some students in Rotherham Technical College who took up to six years to complete a three-year's course, and Lady Williams cites other examples in her case studies of colleges. When this situation is reached at all frequently, one is tempted to ask whether attainments or persistence is being measured; and whether indeed this persistence could not be put to more profitable use by better guidance at an earlier stage. One may question the human wisdom of a situation which evidently discourages so many and exacts a kind of blind doggedness of others; and finally, one may ask whether the repetition of a whole year because of a failure to satisfy teachers or examiners that one of a number of subjects has been mastered, really results in an improved performance later.

Students' faulty choice of careers and courses

Some of the problem undoubtedly lies in a faulty choice of course—faulty either because it has no apparent (or actual) relevance to the chosen career, because the career itself is not the right one, or because the student has over-estimated or wrongly judged his capacities to study it in the actual circumstances in which he will work. Often it is a combination of all these.

Technical college courses, in the main, are designed to give an education specifically geared to a particular career and if the career itself is badly chosen, however good a course may be, students will almost inevitably reap less than a full measure of benefit

from it. Most young school-leavers who wish to get on in industry must be apprenticed in some way by the age of sixteen years unless they are offered a student apprenticeship two years later when they leave a grammar school with certain G.C.E. 'A' qualifications. The majority of fifteen-year-olds, therefore, are faced with two major problems: the choice of a career, which in itself will determine the type of technical college course they enter; and the educational programme they should undertake in the year between school-leaving and entrance to technical college.

The choice of a career is particularly hard for a fifteen-year-old boy or girl, especially since the breakdown of older patterns of guidance whereby sons followed their fathers and daughters their mothers into the same trade or one closely similar. Today, more than at any other time hitherto, even the school-leaver of limited ability has open to him a relatively wide range of jobs, each involving some measure of vocational training within the technical college. Unfortunately, in the face of this array of choice few school-leavers possess realistic knowledge both of their own capacities and limitations or of what is implied in any given vocation. Rarely do they have even the knowledge of how to find vocational information for themselves. In any case a choice made as early as fifteen tends to be unrealistic, for, as Strong points out, of all the change which takes place in an individual's vocational interests, by far the larger occurs between the ages of fifteen and eighteen years. Stott's study, just before the second world war, demonstrated how unrealistic and impermanent are the choices made at this stage. That things have not greatly changed is shown by McGiffin who, in 1958, studied the vocational knowledge possessed by fifth and sixth-formers in two Belfast grammar schools. He found that only 18% of the pupils had adequate information about the working conditions of their chosen careers and that 59% were poorly informed, a conclusion close to that of Jahoda who states that 20% of his sample were well informed and 40% knew little beyond the name of the job. These and other similar findings point to the acute need for adequate information and guidance.

The home still exerts an important influence as has been found by Wilson, McGiffin, Jahoda and Chown working at various periods in several parts of the country and with different socio-economic groups. Even so, the replies of over 500 parents of pupils attending a secondary technical school in Essex to a questionnaire compiled by the writer for the National Foundation for Educational Research showed that parents often gave no formal advice to their children about choosing jobs; in fact, many fathers and mothers explicitly stated that they intended to leave the choice entirely to the child himself.

There are other sources of information and help open to the school-leaver before he accepts a job which leads him to technical college courses. In many areas the local youth employment officer visits each school-leaver—although Jahoda found that only one child in five accepted a job as the exclusive result of the officer's advice. This is a situation which surely needs closer study than it has received. The secondary school staff themselves also play an important role but not every school has a staff member trained and experienced in giving vocational guidance. Fewer still have one fully acquainted through attendance as a student and through careful study with the range of courses offered at technical colleges. One wonders, too, how many can and do effectively help their

school-leavers realistically to appraise their own possibilities, limitations and ambitions in terms of possible careers.

Once a job has been accepted guidance is still needed to determine the most suitable type of technical college course and here one of the most powerful influences comes from within the firm itself. Apparently, however, this is not always sound. Williams pointed out in 1957 that many personnel officers encourage their apprentices as a matter of course to enrol for national certificate courses although in J. Wilkinson's experience these normally cater for only relatively academically able students. Other students would profit more from a City and Guilds craft course, and a considerable proportion should be provided with another type of course altogether in which the academic component is the essential minimum prescribed by actual work's experience. Unfortunately, in far too many cases, the craft course is regarded as a *pis aller* suitable only for the failures of the national certificate courses; and there is little thought and less provision devoted to the third type of student.

When all these factors of inadequate individual vocational motivation and information, faulty or no help from home, school, youth employment service and firm—are taken into account it is not surprising that students accept jobs and enrol in courses for which they lack abilities, attainments and interests. If any one of these is lacking, hard work and perseverance may overcome it, but it must always be borne in mind that the education of the technical college student is mainly part-time, that even a week's absence through illness or overtime working involves an almost impossible task of catching up with his more fortunate class peers, and that this strain is imposed upon him at an age when, quite rightly, his social horizons are widening.

Students' reasons for failure

During the last decade there have been several questionnaire studies of the various reasons given by students for discontinuing their courses. A questionnaire technique has its limitations; however, it is worthwhile gathering together the conclusions which have been arrived at in this way to see what pattern emerges.

One of the earliest reports was that of MacLennan in 1948. Assessing keenness in terms of behaviour which could be observed—such as regularity of attendance, punctuality and pride in work—he found that of a group of 578, 14% were 'very keen'; 25% 'keen'; 33% 'indifferent'; 26% 'antipathetic'; and 2% 'definitely antagonistic.' When questioned about their indifference, students gave as their reason bad teaching—mentioning especially sarcasm, teachers' indifference and inappropriate teaching methods, whilst the staff attributed it to lack of intelligence and interest, and to outside distractions. MacLennan rightly emphasised that neither of these groups of reasons are penetrating enough and must be further analysed.

This has been done by several research workers. For example, Brown gave a questionnaire to groups of over 500 part-time day release students at various levels in electrical and mechanical engineering courses in two technical colleges; Stones, by a similar technique, drew his conclusions from 178 evening class students in a N.W. College of Further Education; and Boyce sent his questions to 963 students who, in 1955-56, failed to complete 75% of the course and prematurely left the Commerce Department of Cardiff

College of Technology and Commerce. In all three the main categories of reply were: interference with social activities; domestic responsibilities; dislike of the teaching methods used; work in class being too rapid; missing or rushing meals and rush to get to classes; lack of facilities for home study and poor college conditions; distance to travel to college; too tired after work to study; circumstances outside their control (which for Brown included bad weather); occupational reasons such as overtime; and in addition for Boyce, marriage; and for Brown, expensive text-books.

All three reports concluded that the most serious problem for married students, as is only to be expected, was their domestic responsibilities and Boyce adds that this is particularly important for married women, and that even for single women domestic ties were an impediment. On the other hand, one of the least important factors for married students was expensive text-books, which is perhaps rather surprising. Also of little importance for the groups as a whole was dislike of teaching methods (except where there was a particularly bad relationship between students and teacher); lack of facilities for home study; poor college conditions; and distance to travel to college, although Boyce found this to be of slight importance for younger females.

On one or two points there is some conflict of evidence. For example, Boyce found that interference with social activities was of slight importance, except for some girls, whilst Brown's group of single students, mainly men, listed it as one of their most important reasons. Again, when studying the influence of missing or rushing meals, Boyce found it to be third in importance for all students, particularly for young girls, whilst Brown found that his single students considered it to be of second least importance and his married group to be least important of all. Perhaps this may be the result of differences in distance to travel, for Stones, in asking the specific question about the rush to get to classes, discovered it to be the most important factor among all his students.

On the other hand there is general agreement as to the importance of several other factors. Work in class which is too rapid was found by both Brown and Boyce to trouble many students, especially older married ones; occupational reasons such as overtime affected mainly males, particularly the younger married ones; whilst examination reasons such as too young to sit, ineligibility to enter, or taken before the end of the course, were found by Boyce to be second in importance for all males. Again, tiredness after work was found to be a strong reason.

Under the conditions in which most technical college students do their work, the difference between success and failure may often turn on some factor which would not be of such crucial importance under the less strained conditions of grammar school VIth form and undergraduate studies. The use of libraries and books for study purposes is often of critical importance and yet a study of technical education reveals two great gaps in this respect. Recently, the National Foundation had contacts with every technical college library in this country and found some colleges either without libraries or with inadequate ones, despite the spur to improvement given by the 1956 White Paper. Again, the part-time nature of the courses tends to discourage the use of libraries. It is a natural wish on the part of students to get home and this itself is a powerful dis-incentive to search for information in the crowded conditions found in most college libraries. Many libraries, too, are not open in the evenings in any case because of lack of trained staff.

Accordingly, students have to rely upon public libraries or upon their own book purchases. No formal study is reported of the first factor, although it is common experience that public libraries are less used than they might be because students are often ignorant as to how to go about getting books from them. This problem is so urgent that some authorities, such as Hertfordshire, have instituted in their colleges a tutor-librarian system to overcome it.

It is not unnatural that technical college teachers, aware of this, should attempt to concentrate essential facts in to their actual teaching periods. This may be a contributory cause to dullness in teaching, to the feeling that a missed lecture is difficult to catch up and to the difficulty which some students have in following.

A second problem was also found to be grave by Brown who, in 1950, investigated the number and sorts of text-books owned and used by students in national certificate engineering classes in a London, a Northern and a Midlands technical college. A study of personal income and general expenditures showed that the great majority of students could at that time well afford to spend at least £1-£2 each session on text-books. He found that for the S1 and S2 groups only a minority of students owned even one book for each subject and that, in general, the level even in the examination year of S3 was a bare minimum. Accordingly, he recommended that advice be given on the purchase of books together with help in the use of books and libraries. If possible, too, the college might establish a second-hand bookstall or college hire-purchase system as occurs in some university students' unions.

Some possible lines of progress

Rewards

In a recent study Jenkinson did valuable service by pointing out that hitherto most investigations had concentrated upon reasons why students failed and that there were relatively few studies of positive methods of encouraging success. It might be assumed, for example, that financial rewards given by employers would stimulate students to perform better. In a study of this question, Stones found that the two main incentives were the desire to get better jobs and promotion. A rather surprising third place was accorded to the general educational value of the courses—unless this was a reply given to please the questioner. He also found that the reasons were given in the same order irrespective of sex, marital status or age.

In 1952, Brown made a rather more detailed study through interviews and questionnaires aimed to get students' views on the relative merits of certain incentives to study in part-time courses in a N.W. technical college near Manchester. He found that the financial rewards given by firms varied from immediate pay rate increases—from about 5/- to 10/- a week—to single cash payments of from £1-£10, and recommendations possibly leading to increased pay. These, however, were awarded only on national certificate results; and he stresses that in no case did a firm give a pay increase for even the Final City and Guilds examination. Thus, the impression that this is really an inferior examination and course was powerfully reinforced.

Of the non-financial rewards, the most coveted by students were appointments to the staff away from the factory floor. Typical reasons given for this mention signs of

improved status (such as not having to wear overalls) and later hours of starting work, and connected with both the explanation that it was possible to meet nicer girls in the headquarters block than in the factory shops.

However, one point is worth remembering; a statistically significant proportion of students did not receive a reward of any kind but yet commented favourably upon their firm allowing part-time day release for study purposes, indicating perhaps that this was reward enough.

In 1956, Brown undertook a further survey and found the results of his early work confirmed. From his questioning of part-time teachers he concludes that the main motive for obtaining certificates was to obtain money rewards, promotion and social prestige. Moreover, good students were often distinguished from the bad in that they were consciously trying to improve their standing whilst many of those who did not do well considered that their present job, such as wireman, needed no further qualifications. This last point, of course, raises educational and vocational problems of great importance and complexity.

The use of examination results for guidance

Some attempts at guidance have been made based upon sessional examination results. For example, in 1959 Hutton, basing his conclusions on students at Rotherham Technical College, considered that failure in the S1 sessional examinations reveals most of those students who cannot pass the ordinary national certificate, but he added that some lecturers consider this process of selection to be too drastic, excluding some underachievers who may later catch up with their more successful contemporaries. As a modification to meet this challenge he suggests excluding students from a course only if they fail S1 twice, or having passed S1 on the second attempt fail S2, or having passed S1 on the first occasion fail S2 twice. This could involve both a considerable loss of time and a number of failures, which are depressing to both students and staff. To avoid the experience of several failures for those who would not be likely to pass and to allow those to go forward who have a chance of passing, Hutton suggests a " border zone " procedure based upon the mark totals of the S1 examinations. He proposed in effect two ways of doing this. The first would determine a border-zone which has been found empirically to indicate about 80% of final failures and would be based on a combined maths., science and drawing result, totalling at least 131 marks, with certain minimum pass levels in each subject. Alternatively, he suggests that after a few years' experience, it should be possible to establish a border-zone the upper limit of which would cut off all certain passes and the lower all certain failures; within this would fall the doubtful borderline cases, which could then be more flexibly handled.

It might be objected that such procedures would be valid only if the S1 examination is itself valid and can be shown to be so. Hutton's work tends to support this and is itself confirmed by Jenkinson's earlier conclusion about the diagnostic value of S1 results for of 69 students who gained higher national certificates in 1952, '53 and '54 Jenkinson found that not one had failed their S1 year previously. Therefore, he too accepts an aggregate maths., science and drawing score of 139 as being a critical minimum for allowing a student to continue in an ordinary national certificate course. At the same

time, Jenkinson also concluded that the S2 had little prognostic value. In 1958 he re-affirmed these conclusions and added that S1 failures who transfer to craft courses have a high chance of succeeding. Similarly, he studied the prognostic value of S3 results for selecting higher national certificate students, noting that a pass with a total mark of 170 or above suggests success in the A2 level two years later even if the student has had to repeat some part of his course at a previous stage. Below this mark students should be advised to take alternative courses, particularly if they have failed in any one of the previous sessions, since the transition from ordinary to higher national courses involves a change to university level studies and is beyond the ceiling of some students' abilities. Alternatives for those whose success in H.N.C. is doubtful may be found in those City and Guilds courses which are open only to ordinary national certificate holders.

At this point we may pause to ask ourselves whether the kind of examination normally used at the end of technical courses at any level is—in spite of the evidence offered above—the most effective instrument of guidance. From work in the general field of educational guidance and prediction, and particularly, of course, from follow-up studies of 11-plus allocation procedures, we know that an examination of present attainment is more likely than most other measures effectively to predict future attainment in the same subject measured later by an examination of the same type.

There are two matters at issue here. The first is that of how reliable and valid such examinations are. No studies have been made specifically of these features of the S1 examinations or of the O.N.C. examinations. It seems not unlikely that they will be no more reliable than similar examinations have been found to be elsewhere and that therefore, while they will undoubtedly detect the clear-fail and clear-pass candidates, the border-zone will be uncomfortably large and the examination correspondingly difficult One is tempted to doubt whether from year to year or from college to college the limits of 131, 139 and 170 mentioned above would have the same meaning and the same predictive value. The second point is perhaps a more subtle one. Some of the agreement between S1 examinations and success later may be due to the fact that abilities having no necessary relationship to the attainment in question are called for by the way in which the examination papers are set—the ability, for example, to write connected prose, or the sheer ability to convince an examiner that one knows more than one sets down on paper. Thus, guidance based upon S1 examinations may be at once somewhat precarious, and tend to foster the kind of candidate who has a reasonable facility in answering a particular type of examination paper the structure of which has little relation to the vocation for which he is being trained.

We may finally ask whether—since the methods proposed above involve for those candidates who fail at least one year of more or less wasted effort—no better methods of guidance could be devised. Jenkinson, at the conclusion of the study just cited, in fact advocates the construction and use of attainment tests particularly in mathematics, for use in place of the current forms of S1 examinations. This would probably improve the accuracy of measurement and consequently of prediction; but it would leave the problem of time waste unsolved.

Hence, we may well ask whether, by the use of standardized psychological tests—of attainment and of ability—the guidance process cannot be started earlier and some at least

of the inevitable failure avoided by aiding students correctly to choose their courses from the outset of their career in the technical college.

The Use of Objective Tests for Guidance

This apparently simple suggestion is complicated by a large variety of factors. It has already been noted that within technical colleges there is a great range of courses and of age groups of students. A similar or even greater range is found in both the abilities of students to learn and in their levels of prior attainment, particularly in the basic subjects of English and mathematics, science and drawing. It has been found in the National Foundation's own research programme which seeks positive methods of improving guidance, that within the groups pursuing the same course were students whose abilities ranged from the top few of ' B ' forms in grammar schools to the lower levels of secondary modern schools' second streams. This diversity complicates the teaching problem in two important respects—especially when it is remembered that the majority of technical college lecturers are untrained and even part-time. It restricts the type of topics which can be taught; and in any one class will be found students whose attainments are of different degrees and which have been acquired under widely different conditions in the various contributory secondary schools.

These conditions are further complicated by the part-time day release system which severely restricts the colleges' freedom of action in guiding students into levels of course appropriate to their abilities, attainments and interests. The overriding factor in streaming or grouping is not, in fact, educational or in terms of ability; it is administrative, in that the employer decides to a large extent the day on which his apprentices can be released. In addition, as Lloyd points out, there is very little time for college staff to give suitable guidance during enrolment week, the time when all students come armed with misconceptions and ignorance and seek entrance to the wide variety of kind and levels of course open to them.

Even so, it is a little surprising that in the face of this situation small use has been made of tests of ability, interests and attainments. Such group tests would at least provide an appraisal of some of the salient characteristics of students and give some indications on which to base decisions. It is not sufficient to criticise such tests as untried instruments, for under rather similar conditions in the United States, as Novak has described, there is a definite allocation of resources and time to this vital function. In any case, the levels of wastage already noted seem to reveal inadequacies in the present system underlining the need to try any reasonable guidance device.

Several colleges are at present experimenting with such standardised tests. One of the main problems is that at this stage few reports are available of their validity under technical college conditions. This problem is being examined in the research programmes of the National Foundation in several colleges in Southern England and by Venables in the Manchester and Birmingham districts. In the N.F.E.R. programme several sub-tests of a differential ability battery are showing themselves to be of value in the placement of national certificate and City and Guilds students. Venables' enquiry has gone further and suggests that by the use of objective tests the proportion of students failing ordinary national certificate courses and trade examinations can be reduced by twenty per cent.

Naturally, these two programmes have yielded results which so far are tentative rather than conclusive, but it is important that these and similar research projects be continued and reported.

Conclusion

This review of available evidence reveals high levels of wastage and withdrawal from courses in technical colleges irrespective of geographical region, type and level of course and method of organisation. Wastage is, of course, high elsewhere in our educational system, even where conditions are comparatively favourable; but it seems, for a variety of reasons, only some of which we know at present, to be particularly damaging in a sector where, everyone is agreed, we can least afford it. The Colleges have very serious problems confronting them—as anyone who has ever been present during an enrolment might well admit—and individuals and organisations within the technical colleges themselves are making very great efforts to solve them.

However, it does seem to be clear that one at least of the major points of attack—and there are a number of others—would be that of developing practical methods of guidance for students both at the transition from school to work and throughout their courses, particularly at those stages where the student has to choose whether to go on or to give up completely. It is difficult even to sketch, at the present, an adequate practical scheme since in any guidance procedures, school, college, industry, parents and the student himself would have to be closely implicated and use would have to be made of a variety of means, including examination results, objective tests of ability, aptitude and attainment, assessments of interests and of personality as well as of techniques specially devised to enable the student to take account of his own strengths and weaknesses and, in fact, to take important decisions for himself. Such a procedure, however it were devised, would take time and skill. A vocational and educational decision of such importance to a student's future is one that cannot be taken rapidly or lightly. Once this is recognised, the need to come to a decision progressively might cause repercussions on the nature of the student's first year at college. This might well become more of a year of orientation and finding out about oneself, about courses and jobs than it is at present. One would expect, too, that the present tendency for schools and technical colleges to draw closer together would be reinforced. In turn one would hope that the administrative separation between vocational guidance and educational guidance will be bridged and the close interdependence of the two recognised. In certain continental technical education institutions, such for example as the Université de Travail at Charleroi in Belgium, a member of staff specially trained in educational and vocational guidance heads a service which is responsible for guidance, general welfare and medical attention of all students. It seems likely that the costs of such a service are more than recouped in the saving of student and staff time through failure and in the less directly measurable prevention of industrial and personal maladjustment.

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Research Note:

Distribution of Methods of Teaching Arithmetic in Primary Schools in England and Wales*

by J. B. Biggs.

WHAT follows is a report on a subsidiary aspect of the N.F.E.R. study of methods of teaching arithmetic in primary schools. Full details of the plan of this project are given in the current Annual Report and will not be repeated here.

In the early stages of the enquiry a short, single page questionnaire was sent by co-operating Local Educational Authorities (61) to schools in their areas. For the purpose of the main investigation it was not necessary that the sample should be representative since the problem was one of selecting a few suitable schools which could be tested and compared. When the returns had been received, however, it became clear that the results were of interest in their own right: a large number of schools and authorities had been circulated and the data thus obtained give an interesting idea of the distribution of certain methods in the country as a whole. The aim of this note, then, is to present these data from this latter point of view.

Each headteacher was asked, in the questionnaire, to provide the following information:—

1. *General:* Type and size of school and sex of its pupils.
2. *Arithmetical Methods:* There were three questions here which asked about the school's method. Headteachers were asked specifically whether or not they used the Stern or Cuisenaire apparatus, then any definite method involving special apparatus apart from Stern and Cuisenaire. They were also asked how these methods were used—e.g. throughout the school, with backward children only, and so on. A further question concerning the length of time the method had been in use was also asked. This was of great importance for sample selection, but has no bearing on the present purpose and is therefore omitted from this analysis.
3. *Teaching Practice:* Two self-ratings were asked for concerning general practice in arithmetic teaching. The first was a five-point formality rating, ranging from 'Highly formal approach' to 'Almost entirely active methods'; and the second was also a five-point rating on use of concrete materials and project work ('A very great deal' to 'Not at all').
4. *Willingness to participate:* Of crucial importance to the research itself is the question about the willingness of the headteacher concerned to participate in a further investigation, involving testing. These responses were included in the present analysis for their intrinsic interest, rather than for any practical importance in the present context.

*The apparatus used in some of the methods mentioned in this article is described in 'Teaching Arithmetic by Concrete Analogy' by J. D. Williams in this number of Educational Research.

Over 7,000 returns were received from schools in 61 L.E.A.s. A few of these were either incorrectly or incompletely filled in and these were discarded. The resulting sample consisted of 6,995 primary schools (1,716 Infants, 1,652 Juniors, 3,448 Junior with Infant, 334 All Age and 15 Special Schools).

Before considering the details of sorting and the results, some words about the generality of the findings is necessary. Firstly, the L.E.A.s themselves were not a random sample. Of the 147 who were initially approached, 23 refused outright to co-operate and there was no reply from 33—as has been stated, the questionnaire was finally circulated amongst 61. It is likely, too, that not every school in the area of each co-operating L.E.A. was circulated and that only some subdivisions within large authorities received the questionnaire. Again, this does not matter at all from the point of view of obtaining a highly selected small sample: it would, however, restrict the generality of the present findings in that it would likewise increase the tendency to overestimate the proportion of non-traditional methods when considering the country as a whole. A rough estimation of the number of schools covered by the questionnaire, in comparison with the actual number of schools within the areas circulated, may be obtained by reference to the Ministry of Education's Statistics Returns. The total for the 61 L.E.A.s is quoted here as being 8,926 schools, almost 2,000 more than the number of questionnaires returned. It was found that the greatest discrepancies between the Ministry figures and our own returns were in the large authorities which were divided into local administrations and evidently some of these had been omitted from the circularisation of the questionnaire. However, the typicality of the sample according to school organisation can be gauged by reference to the proportions of different types of school obtained in the present sample with the Ministry figures for the whole of England and Wales:

Table I

DISTRIBUTION OF TYPES OF SCHOOL ORGANISATION

	Infants	Junior	Jun. with Inf.	All Age	N
National Figures (%)	23.9	48.8	20.1	7.1	23,615
Present Sample (%)	24.6	49.4	21.2	4.8	6,980*

*Excluding Special Schools (N=15).

As can be seen, the sample proportions are remarkably close to the national figures, the greatest discrepancy being in the case of All Age schools. Since the policy is to close these down, it is likely that the co-operating L.E.A.s were disinclined to send the questionnaire to schools which would be unable to participate for this reason—hence the slightly higher proportions of Infant, Junior, and Junior with Infant schools in our sample.

Another limitation is concerned with the definition of non-traditional methods. This will be discussed in more detail in the next section. Briefly, the point is that it is

possible that many schools classified as using, for instance, the Stern materials, may not in fact be using the genuine article, but Stern-like material. Some heads admitted that they (*sic*) " didn't recognise them by name, but we have the blocks," i.e. they recognised material they had in their schools as being similar to the brief description of the material which was given on the questionnaire. Where it was clear, as in this instance, that the materials were not the genuine marketed article, such schools were classified as ' Miscellaneous.'

These points, then, make it unwise to take the percentages quoted here of the frequency of non-traditional methods in primary schools as being typical of the country as a whole. While the reasons given above may lead one to suspect that the sample was biassed in favour of ' progressive ' authorities and schools, it must also be remembered that the questionnaire was issued nearly two years ago, the great majority having been completed in the first three months of 1959. Many of the methods mentioned here have been rapidly gaining in popularity since then and a survey conducted now, on a similar sample, would certainly reveal much higher frequencies than those reported in the present article. Further, there are other methods which were not on the market then but which are now available such as the Shaw, Avon and Dienes materials—the last of these is in use in over 50 schools at the time of writing.

The sorting of the returned questionnaires was carried out according to the following categories:—

1. *Type:* As has been mentioned, the questionnaires were sorted into five types of school organisation: Infants, Juniors, Junior with Infants, All Age and Special.
2. *Sex:* In order to compare the use of non-traditional methods, concrete materials etc. in boys' and girls' schools, the Juniors were sorted into Boys, Girls and Mixed. However, it was found that there was no significant relationship between sex of pupils and use of materials, formality rating or type of method. Accordingly, the Boys Only and the Girls Only schools were pooled with the Mixed for all subsequent analyses. 130 Boys' schools, 105 Girls' and 1,249 Mixed schools were involved.
3. *Size:* The three major types of organisation were further sorted into school size — the relatively small numbers of All Age and Special Schools made it unnecessary to do this in their cases. An arbitrary 50 children per year group was taken as the basic unit for a ' Small ' school, two units for a ' Medium ' school and more than two for a ' Large ' school. This principle was not applicable in the case of Junior with Infants since the majority of these are small country schools with more than one year group per class so that in this case an *ad hoc* classification by size was used. The final figures, defining the ' Small ', ' Medium ' and ' Large ' groups, are contained in the brackets in Table IIA.
4. *Method:* The different methods were defined according to the following categories:
   (*a*) *Traditional.* When there was no answer, or a negative answer, to the three questions asking if Stern, Cuisenaire or ' Other ' were used in the school, that school was classified as traditional. These comprised 75% of the total sample.

(*b*) *Non-traditional Unspecified.* This consists of the schools who answered 'Yes' to the 'Other' question, but failed to describe what the method was.

(*c*) *Non-traditional Specified.* These were the schools which answered 'Yes' to the 'Other' question and gave a (usually) brief account of what the method was. When no 'Standard' non-traditional methods were mentioned, and the scheme was obviously one which had arisen in the school itself, usually with apparatus the staff had invented, these schools were classified as 'Nontrad. Spec.' Categories (*b*) and (*c*) were later pooled to form an 'Individual' method group—i.e. a non-traditional scheme individual to one school.

(*d*) *Stern.* These were simply the schools which answered 'Yes' to the Stern question.

(*e*) *Cuisenaire.* 'Yes' to the Cuisenaire question.

(*f*) *Stern and Cuisenaire.* A surprising number of schools answered 'Yes' to both the first two questions: it is therefore assumed that they operate the two schemes.

(*g*) *Ferrier.* Schools which follow Winifred Ferrier's *Real Life Number* scheme.

(*h*) *Brideoake.* Schools which follow Brideoake and Groves' *Arithmetic in Action.*

(*i*) *Montessori.* The beads and other Montessori apparatus are used.

(*j*) *Miscellaneous.* This category contains all other schemes which were individually too few to classify separately, or which incorporate standard as opposed to home-made apparatus. Under this classification come such schemes as Schiller, Dorothy Williams, Bass, Flavell, Welbent and Unifix.

Categories (*d*)–(*j*) were also pooled for some analyses and were called 'Standard' schemes. It should be emphasised that this does not imply that such schemes are rigid and standardised but that they follow, more or less, a scheme which is available to any headteachers who wish to purchase the appropriate books and apparatus. This is in contrast to the non-traditional 'Individual' category where the scheme is peculiar to a specific school.

5. *Use of Method:* The non-traditional methods were used in widely differing ways. The categories, which of course differed with school organisation, are given in Table III, together with frequencies of use.

6. *Formality Rating and Use of Concrete Materials:* These two ratings were, as has been stated, self-estimations on a five-point scale, by the headteacher. There is evidence obtained in the research study itself that such self-estimations, particularly for formality of teaching, are at best only a rough guide to the actual 'atmosphere' within the school itself. Nevertheless, as will be reported, these self-estimations were found to be related to other school characteristics, sometimes in quite a revealing way.

7. *Willingness to Participate:* There were three classes of response—willingness, unwillingness and undecided or didn't respond to this question. While this category is of more direct use to research workers, it is of general interest to see which types of school, and particularly those which were experimenting themselves with new methods, were willing to put themselves to the experimental test.

Results

Table IIA

DISTRIBUTION OF TEACHING METHODS IN ENGLAND AND WALES

Type and size of School		Percentages of Schools using each Teaching Method										Total Numbers of Schools
		Traditional	Non-Trad U.S.	Non-Trad S.	Stern	Cuisen-aire	St. & Cuis.	Ferrier	Bride-oake	Montes-sori	Miscell.	
Infants	Small (0-99)	62	1	23	0	2	0.3	6	1	1	3	286
	Medium (100-199)	68	1	12	1	3	0.3	8	1	0.3	4	734
	Large (200+)	67	2	14	1	3	0.3	4	1	1	6	696
	Percentage over all sizes	67	2	15	1	3	0.3	6	1	1	5	
	Total numbers of schools	1,143	30	256	14	46	5	104	23	10	85	1,716
Junior	Small (0-199)	92	1	1	1	2	0	1	0	0	2	295
	Medium (200-299)	90	1	3	2	2	0.4	1	0.1	0	1	794
	Large (400+)	85	0.5	6	2	5	1	1	0	0.3	0.3	393
	Percentage over all sizes	89	1	4	2	3	0.4	1	0.1	0.1	1	
	Total number of schools	1,319	12	52	24	38	6	12	1	1	17	1,482
Junior with Infants	Small (0-99)	76	2	11	1	2	1	3	0.4	0.1	4	1,652
	Medium (100-299)	71	11	0	2	2	1	3	0.2	0.2	10	1,213
	Large (300+)	73	6	0	2	4	0.5	2	1	0	12	583
	Percentage over all sizes	73	6	5	1	2	1	3	0.4	0.1	8	
	Total numbers of schools	2,533	202	183	51	86	23	87	13	5	265	3,448
All Age	Percentage over all groups	83	1	9	2	2	0.3	3	0	0	0	
	Total numbers of schools	278	3	29	6	7	1	10	0	0	0	334
Special Schools	Percentage over all groups	47	0	27	0	27	0	0	0	0	0	
	Total number of schools	7	0	4	0	4	0	0	0	0	0	15
Totals for all types of Schools	Percentage over all groups	75	4	7	1	3	0.5	3	0.5	0.2	5	
	Total numbers of schools	5,280	247	524	95	181	35	213	37	16	367	6,995

N.B. Percentages have been rounded to the nearest whole number, except those that are 0.5% or less.

Tables IIA and IIB show the distribution of the non-traditional methods for the 6,995 schools in 61 L.E.A.s in England and Wales, according to type and size of school. It can readily be seen that the highest proportion of schools wedded to traditional methods is to be found, not surprisingly, in the Junior schools, then in the All Age schools. Special Schools appear to be the most willing to try non-traditional approaches, but the numbers are so small it would be unwise to generalise too much about practice in these. Infant schools, as one would expect, are the next most likely kind of school to try non-traditional methods. Inspection of the table shows that this is most likely to be in trying their own schemes rather than in adopting patented approaches: nevertheless, the proportion of 'standard' apparatus used is higher in the Infant Schools than in other types of organisation. The Junior with Infants, and the All Age schools fall between these two. It might be reasonable to suppose that the headteachers of All Age schools are as favourably disposed towards using non-traditional methods as are their colleagues in Junior with Infant schools, but with the 'closing down' policy, they are unable or unwilling to purchase the relatively expensive standard materials.

Table IIB

SCHOOL ORGANISATION AND TYPE OF METHOD (Summary of Table IIA)

	Traditional	Individual	Standard	Total N.
Infants	67	17	17	1,716
Juniors	89	4	7	1,482
Junior with Infants	73	11	15	3,448
All Age	83	10	7	334
Special	47	27	27	15
Total %	75	11	13	
Total No.	5,280	771	944	6,995

There are opposite tendencies with regard to non-traditional methods and size of school between the different types of school. The smaller Infants schools rely much more upon making their own apparatus than do the larger, which, apparently with larger grants, can afford to purchase the standard materials. The reverse is true with the Juniors, where it is the smaller schools which rely upon more traditional methods, while the larger ones *both* devise their own schemes *and* are prepared to purchase standard materials. There appear to be no overall differences in use of traditional methods with the Junior with Infant schools of various sizes.

Some general points emerge. Firstly, a warning might be sounded again about the interpretation of these data. The distinction between traditional and the 'individual' methods could well be a very thin one. It is entirely conceivable that a busy headteacher, not specifically using the Stern or Cuisenaire materials, would not bother to describe the scheme operating in his school; another could in fact be operating an original

Table III

USES OF NON-TRADITIONAL TEACHING METHODS

		Ind.	St.	Cuis.	St. & Cuis.	Ferrier	Other
Infants	Throughout	274	8	27	3	10	96
	Experimenting	0	1	5	0	0	0
	Illustrative	1	1	1	0	0	0
	Backward	1	1	1	0	0	2
	Unspecified	10	3	12	2	3	20
Infant Total.		286	14	46	5	104	118
Junior	Throughout	58	10	7	2	4	15
	Experimenting	0	0	6	0	2	1
	Illustrative	0	1	0	0	0	0
	Backward	6	10	21	4	4	3
	Unspecified	0	3	4	0	2	0
Junior Total		64	24	38	6	12	19
Jun. with Inf.	Throughout	292	25	38	3	19	112
	Infants only	18	3	7	4	28	54
	Junior only	2	1	2	0	1	6
	Inf. & Jun. Backward	0	4	8	0	1	11
	Experimenting	7	0	7	2	0	0
	All Backward	0	1	11	2	0	3
	Illustrative	1	0	0	1	0	0
	Unspecified	65	17	13	11	38	97
Jun. with Inf. Total.		385	51	86	23	87	283
All Age	Throughout	16	0	1	0	3	0
	Infants only	0	0	0	0	3	0
	Inf. & Jun. Backward	2	1	0	0	0	0
	Experimenting	0	0	1	0	0	0
	Unspecified	14	5	5	1	4	0
All Age Total.		32	6	7	1	10	0

Figures are actual frequencies, not percentages.

scheme but may hesitate to go so far as describing it as ' a definite method involving special apparatus.' In both cases their respective schools would be classed as ' traditional,' whereas a less self-critical headteacher could (and some did!) go to great lengths to describe what was evidently a traditional approach. However, one has to draw an objective line somewhere and where the head *did* go to the trouble of describing a scheme, his school was placed in the appropriate non-traditional category. The data on standard methods should be much more reliable from this point of view. Here, one can see the popularity in the Infant schools of the ' motivational ' approaches of Brideoake and Ferrier, the latter being the most popular standard approach for infants. The Junior with Infants, however, tend to adopt ' structural ' approaches, such as the Stern and Cuisenaire. A possible reason for this could be that, being more ' mathematical,' they can very readily and suitably be used by the junior and especially the backward junior children.

Table III gives a clearer idea of the uses of the methods. It can be seen that by far the greatest use in the Infants is as a whole approach (the majority of ' Unspecifieds ' are presumably also used throughout the schools only it was not explicitly stated to be the case). ' Experimenting ' refers to the method being used on trial with a limited number of children; ' Illustrative ' as a special technique for illustrating specific topics, e.g. the Cuisenaire, is well suited for lessons on fractions; ' Backwards ' means that the material is used with a few backward children only and not as general techniques with the whole class or school; ' Unspecified ' means that the headteacher omitted to state how the method was used. Additional categories were needed for Junior with Infants and All Age schools: often the method is used only in the Infant Department or sometimes with all the infants and the backward children in the junior classes. A rather strange category is the ' Junior Only ' where the non-traditional methods are employed with the juniors but not with the infants—this occurred in 12 cases.

Table IV shows the distributions and means for the self-ratings on formality. Many of the Junior with Infants (352 schools out of 3,448) and the All Ages (18 out of 334 schools) gave separate ratings for their Infant and Junior Depts: these are quoted separately. The total is made up of all separately rated *departments*, and hence the final figure is greater than the total number of schools. The extremes of the distributions are perhaps the most revealing—that, for example, as many as five Infant schools (admittedly only 0.3%) would describe themselves as ' highly formal ' and that only two Junior schools in the whole sample admit to using a thoroughgoing active approach. With the exception of All Age and Special Schools, there is a significant association between a low self-rating on formality and use of non-traditional methods. Where whole schools are compared, the Infants' headteachers see their schools as being less formal than any other type of organisation, with the exception of Special Schools, whereas Junior School heads rate their schools as the most formal. It should be pointed out that these scores are not objective estimates of formality: if they were, there would probably be far greater differences between Infants and Juniors. Thus, a ' highly formal approach ' in an Infant school, on this set of ratings, is almost certainly a good deal less formal in actual fact than a ' highly formal approach ' in a Junior school. The departments where the headteachers see their approach as less formal than any other are the

Table IV

SELF-RATINGS ON FORMALITY COMPARED WITH METHOD

	HF %	F %	M %	A %	HA %	Mean	Total No. of Schools	HF %	F %	M %	A %	HA %	Mean	Total No. of Schools
			Infants					Juniors						
Trad.	0.3	17	43	35	6	2.71	1143	3	82	14	2	0	3.85	1319
Individ.	0	13	36	42	10	2.51	286	0	61	33	5	2	3.53	64
Stand.	0.4	12	36	40	12	2.48	277	1	72	17	9	1	3.63	99
Overall %	0.3	15	40	37	8	2.64		2	80	15	2	0.1	3.82	
Total Number of Schools	5	257	688	628	128		1706	37	1185	225	33	2		1482
		Infants & Juniors						All Age						
Trad.	1	46	40	13	1	3.33	2320	2	65	28	6	0.4	3.62	265
Individ.	0	37	43	17	3	3.14	335	0	43	47	7	3	3.30	30
Stand.	1	34	41	21	3	3.09	441	0	67	24	10	0	3.57	21
Overall %	1	43	40	15	1	3.27		1	63	29	6	1	3.58	
Total Number of Schools	20	1337	1248	449	42		3096	4	199	92	19	2		316
		Infants & Juniors (Different Rating for Each Department)												
		Infant Department						Junior Department						
Trad.	1	3	48	38	9	2.50	213	3	76	16	5	0	3.77	213
Individ.	0	2	20	56	22	2.02	50	0	58	28	14	0	3.44	50
Stand.	0	1	33	48	18	2.17	89	2	62	21	12	2	3.49	89
Overall %	1	3	40	43	13	2.35		3	70	19	8	1	3.66	
Total Number of Schools	3	9	142	152	46		352	9	245	68	28	2		352
		All Age (Different Rating for Each Department)												
		Infant Department						Junior Department						
Trad.	0	8	62	8	23	2.54	13	0	69	8	23	0	3.46	13
Individ.	0	0	100	0	0	3.00	2	0	100	0	0	0	4.00	2
Stand.	0	0	100	0	0	3.00	3	0	100	0	0	0	4.00	3
Overall %	0	6	72	6	17	2.67		0	78	6	17	0	3.61	
Total Number of Schools	0	1	13	1	3		18	0	14	1	3	0		18

Special Schools

Table IV (cont.)

	HF %	F %	M %	A %	HA %	Mean	Total No. of Schools
Trad.	0	14	29	57	0	2.57	7
Individ.	0	0	25	75	0	2.25	4
Stand.	0	0	50	50	0	2.50	4
Overall %	0	7	33	60	0	2.47	
Total No. of Schools	0	1	5	9	0		15
	All Departments						
Trad.	1	49	33	15	2	2.32	5506
Individ.	0	30	37	27	6	2.91	823
Stand.	1	32	35	27	6	2.94	1026
Overall %	1	44	34	18	3	3.22	
Total No. of Depts.	78	3248	2482	1322	225		7355

N.B. 1. Percentages have been rounded to the nearest whole number, except those that are 0.5% or less.

a. HF = Highly formal approach;
F = Basically formal, with limited amount of active work;
M = Midway;
A = Active methods with some formal work;
HA = Almost entirely active methods.

Junior with Infants, where the Infant Department is rated separately from the Junior. In this case, it is interesting to note also that the mean rating for these Junior Departments is still a good deal lower than in Junior Only schools. This ties in with the finding from the previous section that Junior with Infants are more liable to use non-traditional methods (even where one leaves out of account those schools where they are employed in the Infants Department only), than are Junior Only schools. Of the 352 Departments in the Junior with Infant schools which were rated separately, it was surprising to find eight cases (six of which were traditional schools) where the Infant Dept. was rated to be *more* formal than the Juniors. Unfortunately, the headteachers' reasons for this were not stated (young children need more discipline. . . .?). The association between size of school and formality was tested in the case of Infants and Junior schools and it was found that there was a significant tendency for small and medium sized Infant schools to rate themselves as being more formal than large schools. In the case of Junior schools, however, there was no relationship at all between size and formality. In sum, then, one could say that Junior schools, not surprisingly, are both more traditonal and more formal than Infant schools. In both Junior with Infants and All Age schools, the Infants Departments seem to exert a moderating influence on the schools as a whole since even

where the Junior Department is rated separately from the Infant, it is still less formal than the Junior Only schools. Since many schools with both departments use non-traditional methods throughout, it is not surprising that Infant attitudes and approaches to work should pervade the Junior Departments—certainly the evidence is that any such influence is from Infant to Junior rather than *vice versa*.

More important than these bare figures, however, are the attitudes and reasons which underly them. The highly formal approach in Junior, and especially Junior Only, departments—is this due, for instance, to the formal demands of current secondary selection procedures, or to a genuine belief that a formal approach is psychologically more appropriate for older children? In the more detailed findings amongst the 87 schools in the research study itself, there were many headteachers who lamented the fact that they adopted a formal approach and would like to use more informal methods, but felt, rightly or wrongly, that by so doing that might jeopardise their children's chances in the 11+. Again, with regard to the association between formality and method, one would like to know the reasons why certain schools did adopt non-traditional methods: is this because progressive headteachers feel that these methods are more conducive to an informal school atmosphere and hence make use of them, or are these methods adopted because it is felt they are more efficient at getting the children to learn the formal techniques of arithmetic and only later does the informal 'backwash' of these methods occur? To mention the major research study once again, this last reason occurred several times in the Junior schools, and one can see a similar thing operating in the present data: those Junior schools who go to the trouble of designing their own schemes (see Table III) use them as a whole approach, while many of the standard methods, particularly the 'structural' variety, are used to help push on the backwards. These differences in approach are reflected in the formality/method distributions of the Junior schools. Unfortunately, however, the questionnaire was too short to enable one to obtain the appropriate data to provide a firmer basis to these speculations.

The headteachers' estimates of the extent to which they made use of concrete materials and project work was compared with school type and use of non-traditional methods (see Table V). These findings merely supplement those based upon formality and use of method. The mean score is the average of the five-point rating, weighting the top item as 4 units and the 'none at all' item as 0. Special schools again seem to make more use of concrete materials than any of the others: next come the Infants Only. The All Age and Junior with Infants have been divided into two categories: the first where the Infant and Junior Departments are given the same ratings and the second, where separate ratings were used, the effect in both cases was to increase the overall mean score for the whole school—another instance, perhaps, of the Infants Dept. influencing the Junior. It is interesting to note that in seven of the schools with separate ratings (five of which were traditional) the *Juniors* were said to use more concrete materials than the Infants—and again, one would like to know the rationale for this. It will be perhaps disturbing to some to note that the average Junior rating falls between the points 'not very much' and 'not at all.' The All Age mean rating is not very different from this.

The final comparison is with type of school, method and willingness to participate in the research project (Table VI). Nearly two-thirds of the total sample were willing

Table V—USE OF CONCRETE MATERIALS (Mean Scores based on five-point self-rating.)

		N	Mean of Ratings
INFANTS	Trad.	1143	2.62
	Individ.	286	2.90
	Stand.	287	2.86
Total		1716	2.71
JUNIORS	Trad.	1319	1.84
	Individ.	64	2.23
	Stand.	99	2.05
Total		1482	1.87
JUNIOR WITH INFANTS*	Trad.	2398	2.12
	Individ.	338	2.30
	Stand.	469	2.32
Total		3205	2.17
JUNIOR WITH INFANTS†	Trad.	135	2.33
	Individ.	47	2.49
	Stand.	61	2.51
Total		243	2.41
ALL AGES*	Trad.	273	1.96
	Individ.	30	2.23
	Stand.	22	2.09
Total		325	1.99
ALL AGES†	Trad.	5	2.10
	Individ.	2	2.75
	Stand.	2	2.75
Total		9	2.50
SPECIAL SCHOOLS	Trad.	7	3.00
	Individ.	4	3.50
	Stand.	4	3.00
Total		15	3.13

* Both Departments same rating

† Each Department different rating.

to do so, and considering the fact that the details of the proposed study supplied to the headteachers were minimal, this must be considered as a very encouraging response and perhaps an indication of the general concern about the state of arithmetic teaching. This unease is probably at its strongest in the Junior school, which is where the highest proportion of agreement to take part was found. One can readily understand the reluctance of Special School headteachers to participate and possibly many All Age school heads felt that, with the prospect of closing down, there would be little point in agreeing to any research in their schools. When analysed according to school size and type of method (these data are not included in table form) it was found that non-traditional schools whether individual or standard, were significantly more willing to participate than traditional schools—especially in Junior Only schools. Also, size of school was significantly related to willingness—possibly because the large schools were conveniently situated in an urban locality and had the means to try out standard methods and wished to have them evaluated. In large Junior schools using non-traditional methods, the proportion willing to participate was as high as 85%.

Table VI

WILLINGNESS TO PARTICIPATE IN RESEARCH

		Yes	No	?
Infants	%	61	32	7
	N	1048	542	126
Juniors	%	67	28	5
	N	987	415	80
Junior with Infant	%	58	34	8
	N	2012	1176	260
All Age	%	50	41	9
	N	168	137	29
Special	%	40	53	7
	N	6	8	1
Total	%	60	33	7
	N	4221	2278	496

Conclusions

Bearing in mind the limitations of this survey in terms of possible initial biasses of the sample and of the lapse of time since the questionnaire had been issued, these results have nevertheless some importance. Unfortunately there was insufficient time to look at all the possible interactions and combinations of data—for example, whether or not schools using non-traditional methods with backward children only are more formal than equivalent schools who use them throughout. The various combinations of the variables are virtually limitless and, generally speaking, the findings presented here are restricted to direct associations with use of method and the other variables. The questionnaire was (necessarily) brief and it possibly raises more questions than it answers: those that it does answer are mostly self-evident, such as the higher frequency of non-traditional methods in Infant schools or departments. The really important question—whether in fact these non-traditional methods are more effective than traditional methods in Infant, Junior or both departments—remains of course outside the scope of this part of the enquiry. It is hoped that the major research project will throw some light on this question.

The present data consistently throw up differences between Infant and Junior school practice: it is not possible to say whether this difference is due to outside circumstances or to a belief that juniors *need* sound drilling in formal work, for which purposes traditional methods are probably as good as any. The apparent concern for arithmetic teaching, illustrated by the keen desire of Junior heads to take part in research, coupled with the fact that in those parts of the country such as Leicestershire, where there are some areas which do not have a selection examination at 11+ and where the Junior schools follow the Infant schools with respect to lack of formality, use of non-traditional methods and so forth—these points collectively suggest that Junior headteachers would like to make more use of non-traditional methods than they in fact do. It is perhaps significant too that where Infant and Junior Departments are in the same school, it seems that Infant practice is more likely to modify the approach in the Junior Department, than Junior methods to ' toughen up ' the infants. In a report on the 1955 National Survey, Pidgeon (1959) states that when the appropriate allowances are made for environmental factors, there is " some indication that the performance of the children in combined Junior with Infants schools is superior " (see also Table VIII in the same article). There is then, some objective evidence that this tendency of modifying the Junior approach does in fact pay. Certainly there are excellent *a priori* reasons why there should be at least continuity between the two departments (see, for example, Pidgeon, *op. cit.*).

Some may consider it surprising that as *many* as one-quarter of the total sample made use of non-traditional methods. In view of the current concern with arithmetic and mathematics teaching, and of the present availability of even more radical attempts to allay this concern, a further survey, with perhaps a more detailed questionnaire, would provide some very interesting comparisons with the present findings—the author's guess would be that, allowing for the bias in the present sample, the proportions would be probably a good deal higher than the one-quarter reported here.

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N.F.E.R. Annual Report, No. 14, 1960: 79, Wimpole Street, London, W.1.
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Research Note:

ATTENDANCE THROUGH THE SCHOOL YEAR

by FRANK SANDON,
(formerly Headmaster, Millom School, Cumberland)

Fluctuations in Attendance

RECOGNISED schools are required by the Ministry of Education Regulations to keep attendance registers for each session to show the presence or absence of each pupil. The pupil is required by law to be present. The most commonly accepted reason for absence is sickness, though absence in order to spend holidays with parents is also recognised. In the very great majority of cases sickness is given as the cause of absence, though this is not necessarily substantiated by a doctor's certificate.

A knowledge of the pupil's reaction to the requirements is clearly desirable in any discussion about a change in the arrangements of terms or in the dates of annual examinations.

In an earlier enquiry*, it was found that there was an increase during the week in the number of absences, those at the end of a week being some 25% more than those at the beginning. The true sickness incidence could hardly account for this, and it was suggested that psychological reasons for absence must be considered. Is there something of the same feature in evidence through the term or the year? An analysis of absence must clearly be by averages over a number of years, as an epidemic can easily distort the

Months	N.H.I. Sickness Claims (in thousands)	Average Percentage Absence			
		City Schools		Country Grammar School	
		Primary	Grammar	Whole School	5th Form
	a	*b*	*c*	*d*	*e*
Sept.	121.7	7.8	4.5	4.2	6.6
Oct.	147.6	8.1	4.7	4.9	5.8
Nov.	155.3	10.0	5.1	5.1	6.2
Dec.	139.2	11.7	6.4	6.1	8.5
Jan.	212.0	11.7	7.0	9.7	10.7
Feb.	204.8	13.5	7.7	5.7	8.4
March	175.0	11.3	6.2	7.3	6.8
April	131.2	8.9	4.6	5.1 3.9	8.3 3.3
May	126.8			4.9	4.7
June	112.6	9.8	7.1	5.3	3.5
July	100.3	11.3	7.2	5.8	7.4
Aug.	95.8	—	—	—	—

*Sandon, Frank: "Absence and Recovery recorded at Irregular Intervals, illustrated by School Data," *Biometrika*, XXIX (III and IV), 336-349, 1938.

routine run of the annual sickness incidence (the influenza epidemic of 1957 trebled the ordinary number of claims for National Health Sickness Benefit, and was so marked a feature that even over several years the averages are not smoothed out; this year is not included when we average later on). The figures given in the Table and referred to in the following analysis are all based on the averages of a number of years.

The Annual Cycle of Adult Sickness

The first column (*a*) gives the annual number of N.H. Sickness Benefit claims. It will be seen that there is an annual cycle, with a maximum in January and a minimum in August. The December sickness figures are anomalous, those for October, November and January all being greater (the number of *deaths* rises steadily from October to January): the sickness is probably not reported on the same basis as in the other months—the approach of Christmas tends to keep folk at work to get their spending money. The figures on which this column is based relate to adults, and cannot be assumed to apply precisely to children, but they seem to give a fair indication of the way in which children's health may vary throughout the year.

The Annual Cycle for School Absence

In a large Midland city the Welfare Officers have for many years tabulated figures for something like ten thousand grammar school pupils currently on roll and for about ten times as many primary school pupils. The resulting figures averaged over a number of years are shown in columns *b* and *c* of the Table. Because of the wandering date of Easter, the April and May figures have been recorded together. We see that on the whole these figures follow the same pattern as the N.H. sickness claims. The primary schools show over half as much absence again as do the grammar schools, and they fluctuate over a wider range—primary schools 5.7% (from 7.8% to 13.5%); grammar schools, 3.2% (from 4.5% to 7.7%). The worst term from the point of view of attendance is the Lent Term. The figures are: *Primary:* Autumn, 9.34%, Lent, 12.21%; Summer, 9.70%; *Grammar:* Autumn, 5.10%; Lent, 6.74%; Summer, 5.99%: in this we have counted all the April figures in with those of the Summer Term.

In the Summer Term, we note that, instead of a fall at the end of the term, as would be expected from the N.H. figures, there is an increase. In some schools, pupils are allowed to stay at home for private study when their form is taking an examination in which they are not involved. The practice about marking these absences is not consistent, but they are not likely to have much effect on the percentage absence figures. The increase may be due to parents' holidays, and it seems desirable to check for this if possible.

Parents' Holidays as a Cause of Absence.

For this we use data from a little country grammar school. Here the records could be checked by the personal knowledge that there were practically no cases of parents' holidays causing any loss of school time; nearly all the holidays were taken in the local industrial holiday period, which occurred outside school terms. The total absence figures considered over ten years were less than ten thousand per month, so that (apart entirely

from fluctuations due to epidemics) the random monthly fluctuations are wider than those for columns *b* and *c*. But the general picture is clear (col. *d*). And here we have the further advantage that we can consider the pre-Easter and the post-Easter April figures separately. Even for this school, we see that there is a rise at the end of the summer term. So rather than seek an explanation for absence in holidays with parents, we must look elsewhere. It seems as if there is some other reason for absence, some loss of keenness on regular attendance as the term wanes just as there was in the case of the week. What is the effect of end of term examinations on attendance? Can we isolate this to any degree from other causes?

Examinations as a Cause of Absence

At the grammar school just mentioned, the Fifth form figures were reviewed for a number of years. For such a small school the total monthly absences considered in any one month were all less than a thousand, so that the average percentage attendance figures (col. *e*) can only be taken as a rather vague indication of the general tendency. Rather surprisingly, the attendance of the Fifth Form was, in general, poorer than that of the rest of the school. The absences of this form fell when examinations were pending, but at the end of the Lent Term (as soon as the ' Mock Examination ' was over) and at the end of the Summer Term (as soon as the External Examination was over) absences increased. The discrepancy between the pre-Easter (8.3%) and the post-Easter (3.3%) April figures is most remarkable.

Weather as a Cause of Absence

There is another feature that is worthy of comment. Whereas columns *a*, *d* and *e* put the maximum in January, columns *b* and *c* put it as February. In the case of *d* and *e* it is known that for January there is an exceptional number of absences due to weather conditions—as many as 50% of the school have been snowed up at times in this month, which shows this phenomenon most pronouncedly. So perhaps the maximum sickness occurs in February for children and in January for adults. There may be an alternative explanation; the N.H. sickness claims may be swollen because of an attitude of the claimants related to that which we saw contributed to the abnormally low December claims.

Summary

In the foregoing analysis the main conclusions that seem to be demonstrated by our figures are:—

(*a*) Most of the absences in recognised schools are due to genuine sickness.

(*b*) The annual cycle for children's sickness follows closely that for adults.

(*c*) The worst term for attendance is the Lent Term, and the worst month is, in general, February.

(*d*) Primary school children are more prone to absence than are grammar school pupils.

(*e*) Pupils' attendance at school tends to be better when they are due for important examinations.

(*f*) There is, however, a tendency to be more casual about regular attendance towards the end of each term and certainly towards the end of each school year.

Note:

It will be observed that we have throughout worked in respect of absence and not of attendance. The latter is more usual in school statistics, but as its percentage usually runs at something in the nineties it does not give immediately such a clear impression of the changes as does that of absence. Where the latter is required as a regular return, it is convenient to use a nomogram. We can prepare a suitable one as follows.

If N is the Number on Roll, and a the absences (or, of course, if a is the sum of absences over a period and N is the sum of the absences and attendances over the same period), then p, the percentage absence, is, of course, $100a/N$. The nomogram can readily be prepared on school quadrille-ruled (graph) paper, with three equal vertical straight lines. On the left hand side AB is graduated logarithmically from 1 at the bottom to 10 at the top. On the right hand side CD is graduated logarithmically from 1 at the top to 10 at the bottom. Midway between these two EF is graduated logarithmically from 1 at the bottom to 100 at the top. A ruler (preferably transparent) placed for the value of a on AB to the value of N on CD will give the value of p on EF. The decimal points can be neglected but allowed for at the end.

A neat sufficiently large nomogram already ruled will be found as Fig. 1 in '*Nomograms*,' by C.V. Gregg (1s.2d. from Mathematical Pie, Ltd., 97 Chequers Road, Doncaster). This gives p by the use of the equivalent formula $Np = 100\ a$, by reading for x the value of N, for y the value of p and for z the value of a, and, as before, allowing at the end for the correct position of the decimal point.

Abstract:

REGULARIZED ENGLISH

by Axel Wijk

An Investigation into the English Spelling Reform Problem with a New, Detailed Plan for a Possible Solution.

Stockholm Studies in English, VII.
Published Almqvist and Wiksell, Stockholm, 1959.

I. Introduction

DR. Wijk reviews previous plans for spelling reform which have been more or less based on the idea of having a particular symbol to stand for one sound only and letting each sound be represented by the same symbol. Such proposals for reform have never had much success and there seems little prospect that they will be accepted. He proposes his own system, to be called Regularized English, which has the following advantages:

(*a*) It does away with most irregular spellings.
(*b*) It retains present spellings in 71% of running words on an average page and thus preserves a high degree of continuity between present and proposed systems.
(*c*) It preserves etymological connections between English, Romance and Teutonic languages.
(*d*) It retains distinctions between spelling in homonyms.

II. The Main Proposals

(*a*) All the present sound symbols should be preserved in their regular, i.e. most frequent, usages. We should reject the idea of a strictly phonetic spelling and allow certain speech sounds to be represented by more than one symbol. Dr. Wijk also lays down rules restricting the situations in which certain combinations of letters can have more than one pronunciation. The only symbol which is not used at all in the system is ' ph.'
(*b*) Irregular Spellings should as far as possible be replaced by regular ones in accordance with rules already inherent in the present orthography. Thus practically all new spellings become self-explanatory. The regularity and irregularity of spellings should be decided by a thorough statistical examination of the way in which existing sound symbols are used in the present orthography.
(*c*) No new vowel symbols have been introduced but the use of ' aa ' and ' oe ' has been much extended. The symbol ' aa,' for example, has been consistently used for the sound ' a: ' when this is not followed by ' r.' Thus ' father,' ' drama ' etc. become ' faadher,' ' draama,' etc.

(*d*) One entirely new symbol ' dh ' is introduced for ' th ' (voiced) in medial and final positions.

(*e*) Voiced ' s ' is written ' z ' except in the plural and genitive ending of nouns and the third person singular of verbs.

(*f*) The silent ' e ' finally has been preserved where the vowel is long, added where a word ends in two consonants and is preceded by a simple regularly long vowel (' childe,' ' pinte,' ' moste,' etc.) and omitted where a simple short vowel is followed by a single consonant, as in ' hav,' ' liv,' ' giv,' etc. It is also used to indicate the soft pronunciation of a preceding ' c ' or ' g '.

One reason for the conservatism of Dr. Wijk's reforms is that he makes use of existing orthographical rules to the fullest extent. In present orthography the difference between the so-called long and short sounds for a, e, i (y), o and u is made clear by the spelling of the word which has often evolved according to definite rules. Therefore no different symbols are needed for long and short vowels. For example, Dr. Wijk distinguishes eight categories of words in which short pronunciation of a simple vowel not before ' r ' occurs and eight categories in which the long pronunciation of a simple vowel not before ' r ' is mainly found. There is a difficulty, however, with words in which the stress falls on the second syllable from the end when the word is followed by a single consonant only, and no definite rules are cited for these except to indicate a short vowel sound by doubling the medial consonant in those words in which a change has been made for some other reason such as ' reddy,' ' hunney,' ' nurrish,' etc.

III. The Necessity for Reform

Dr. Wijk makes a survey of the major works on orthography from 1568 to the present day. He deals in great detail with the reform proposals of the British Simplified Spelling Society and the American Simplified Spelling Board to which he objects primarily on the grounds that 90% or more of the language would be altered in spelling. Some sort of reform, however, is essential for the following reasons:

(*a*) The view that it takes an English-speaking child " from one to two years longer to learn to read and write his language than it takes children of other nations to achieve comparable results in their languages."

(*b*) The convenience of having children learn to read by using rules instead of relying on eye-memory.

(*c*) The fact that the difficulty of English spelling places a false value on spelling ability.

(*d*) The evidence for backwardness in reading. This is cited from the Ministry of Education Pamphlet No. 18; 30% of all 15 year olds have reading ages more than 20% below their chronological ages.

(*e*) The difficulty that foreign students of English have with English pronunciation and orthography.

IV. The Way in which Regularized English could be Introduced

(*a*) A long transitional period should be allowed during which children learned to read and write Regularized English before passing on to traditional English.

This should last for at least twenty or thirty years. When they reach the third year children should be taught to read traditional English but not to write it.

(*b*) The older generation, except for teachers, should be left in peace. It is essential to secure the co-operation of teachers. They are in a good position to realize the shortcomings of the present system.

(*c*) Dr. Wijk recommends English as the principal international auxiliary language and suggests that foreign nations could reform English spelling without waiting for English speaking peoples to accept the reform although Regularized English is designed principally for the benefit of the native speaker.

V. Part II of the book is a detailed application of the general principles to the various vowel and consonant symbols as they occur in different positions.

VI. Abstractor's Comments

The many advantages of this system have been clearly stated by Dr. Wijk, together with some disadvantages. Among further possible disadvantages the following points may be considered:

(*a*) Many difficulties of orthography still remain, particularly with regard to unstressed vowels.

(*b*) No pilot experiment has been carried out to discover whether Regularized English is as time-saving in schools as it is claimed to be.

Example:

Lincoln's Gettysburg Speech.

Foarscore and seven years ago our faadhers braught forth on this continent a new nation, conceevd in liberty, and dedicated to the propozition that aul men ar created equol.

Now we ar engaged in a greit civil wor, testing whedher that nation, or eny nation so conceevd and so dedicated, can long endure. We ar met on a greit battlefield ov that wor. We hav cum to dedicate a portion ov that field az a final resting-place for thoze hoo here gave their lives that that nation might liv. It iz aultogedher fitting and proper that we shood doo this.

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Printed by King, Thorne & Stace Limited, 1-13 Jubilee Street, Brighton, 1,
and published by Newnes Educational Publishing Co., Ltd., Tower House, Southampton Street, Strand, London, W.C.2.,
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